



MODEL

LEARN TO FLY!

December 1988 \$2.95

Canada \$3.75 48120

AIRPLANE

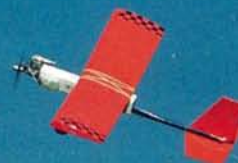
THE WORLD'S PREMIER

**How To: Mount
the G-Mark**



**GET INTO R/C
TRAINER
ISSUE**

**FIELD & BENCH REVIEWS
on 5 Trainers**



**CONSTRUCTION:
Classic Trainer—
The Twilighter**



S.T.A.R.S. Scale Rally



MODEL AIRPLANE NEWS



FEATURES

- 14** **Sig Kadet Seniorita**
by Ralph Cloud
A Field & Bench Review
- 18** **Challenger 720**
by Charlie Kenney
- 26** **Model Tech Trainer 40**
by Peter J. Sneddon
A Field & Bench Review
- 34** **Cox EZ Bee Trainer**
by Budd Davisson
A Field & Bench Review
- 46** **Midwest Aero-Star 40**
by George & Wilma Nail
A Field & Bench Review
- 48** **11th Annual STARS Scale Rally**
by George Privateer
- 58** **Shadow Box**
by Mike Kornely & Kevin Cassidy

ON THE COVER:

This month's cover is a collage of the "Field and Bench Review" kits featured in this issue. They may all be considered "trainers," and two of the reviews were even prepared by newcomers who had never flown an R/C airplane before. One of them is George Nail of El Paso, Texas, who made this a "family project;" the other is Budd Davisson, who demonstrates that full-scale pilots don't always make an easy transition. Kodachromes by MAN staff.

- 66** **Duracraft Duraplane II**
by Rich Uravitch
A Field & Bench Review
- 74** **Trainers**
by Budd Davisson
- 86** **Carl Goldberg Models Vector**
by Chris Abate
A Field & Bench Review
- 89** **Reader Survey**

CONSTRUCTION

- 52** **Twilighter**
by L.F. Randolph

COLUMNS

- 44** **Jet Blast**
by Rich Uravitch
- 60** **Helicopter Challenge**
by Craig Hath
- 62** **Quiet Flight**
by John Lupperger

DEPARTMENTS

COLUMNS

- 12** **Fifty Years Ago**
by Steve Pond
- 24** **Sporty Scale Techniques**
by Frank Tiano
- 30** **How To: Ace Mount for the G-Mark**
by Randy Randolph
- 32** **Basics of Radio Control**
by Randy Randolph
- 41** **Small Steps**
by Joe Wagner

- 6** **Editorial**
by Rich Uravitch
- 8** **Airwaves**
- 22** **Hints & Kinks**
by Jim Newman
- 102** **Product News**
- 128** **Plans Mart**
- 140** **Club of the Month**
- 141** **Name the Plane**

Editorial

by RICH URAVITCH

EVERYTHING STARTS somewhere, right? We think so, and that's the primary reason for this, our "Trainer/Beginner" issue. New modelers/fliers are getting into the sport in ever-increasing numbers, and if they're anything like I was when I started in R/C, they can use *all* the help they can get!

The whole complexion of the hobby has changed, most dramatically over the past five years or so, and much of this is attributable to the growing popularity of the "almost-ready-to-fly" planes, or ARFs, as they're called. Radio sophistication, reliability and value continue to improve—certainly another key contributor to the growth of the sport. So, here we are with a broad range of products to choose from, all competing for that space in your workshop or "hangar." The problem is compounded by the fact that this very competition makes many of these products available at extremely attractive prices. (Great for us who've been here a while; frequently bewildering to the guy who'd like to join our ranks.)

In this issue, we hope to provide the new person with some direction (hopefully sound!), that will enable him or her to give our favorite pastime a shot. We've tried to approach our objective by showing the various types of trainer airplanes that should be suitable for the task. They range from "builder's" kits right up through the ARFs; I think there's a "type" for everyone. I say "type" because this is a monthly issue, not an encyclopedia. Obviously, we couldn't list every trainer currently available, so please bear that in mind before you write to ask, "Why wasn't the _____ included? It's the best trainer ever made!" If you learned to fly on it, it probably *was*. If that was the criteria, there would be a "Field and Bench" in this issue on the old Sterling Mambo—Chris Chianelli and I both learned to fly on it!

Some of you more experienced guys may read this issue and come up with additional helpful advice for the newcomers in your club. Some of you may not agree with what we've included between the covers. Either way, we hope it at least gives you a reason for you to help the new guy; we sure don't mind you piggy-backing off what we've presented here. Remember the guy who helped you get started. Payback isn't a bitch; it's rewarding!

Newcomers... welcome; it's a great sport. We hope you'll enjoy every hour spent in it, and don't be afraid to ask for help: We all did! Don't be embarrassed by mistakes and, above all, remember this: Except for very, very few budding model R/C aviators, crashing is very much part of the learning process. Anticipate it, and it won't be quite as traumatic!

This is probably as good a time as any to ask you for a favor; as a matter of fact, this issue creates the perfect opportunity. Although *Model Airplane News* is entering its *sixtieth* year of publication, nearly all our long-time readers will admit that it's not the same publication that it was even *five* years ago, and that's not by accident. Most of the decisions that influence the direction in which the magazine is headed consider reader input: what's good, what's bad, what you'd like to see more/less of—you know the kind of thing! After all, if we had no readers, why bother! This issue contains a short "Reader Survey" that will enable you to express your feelings concerning your magazine. We're even asking you to pay the postage for the return trip. That in itself may reduce the number of completed surveys we receive, but I don't think so. I think our readers would like a voice in what we present. But, as a hedge,... everyone who completes and returns the survey will be eligible for a drawing for a brand-new PCM radio system. We think it's a fair trade, all things considered; I don't know anyplace else you've got a shot at a state-of-the-art system for two bits! Thanks.

MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGAZINE

Group Publisher
LOUIS V. DeFRANCESCO, JR.
Publisher
DR. LOUIS V. DeFRANCESCO
Associate Publisher
YVONNE M. MICIK

Editor-in-Chief
RICH URAVITCH
Associate Editor
CHRIS CHIANELLI
Copy Editor
LYNNE SEWELL
Editorial Assistants
KATHERINE TOLLIVER
LI AGEN

Art Direction
ALAN J. PALERMO
Assistant Art Director
MARY LOU RAMOS
Art Assistants
ED SCHENK
BRETT ERIC NEWMAN
Typographers
SARA CLARKE
CHERYL CERESI

Advertising Director
FREDERICK J. MURPHY
Advertising Sales
JASON STEIN
Advertising Traffic Manager
CHRISTINA FURIORE
Advertising Production Manager
PENNY CURCIO

SUBSCRIPTION PRICES:
U.S. & Possessions (including APO & FPO): 1 year \$25.00; 2 years \$47.00; 3 years \$65.00. Outside U.S.: 1 year \$33.00; 2 years \$63.00; 3 years \$89.00. Payment must be in U.S. funds.

MODEL AIRPLANE NEWS is published monthly by Air Age, Inc., 251 Danbury Rd., Wilton, CT 06897. Connecticut Editorial and Business Offices, 251 Danbury Rd., Wilton, CT 06897, phone 203-834-2900. Y.P. Johnson, President; G.E. DeFrancesco, Vice President; L.V. DeFrancesco, Secretary; Y.M. Micik, Treasurer. Second Class Postage paid at Wilton, Connecticut, and additional Mailing Office. Copyright 1988 by Air Age, Inc. All rights reserved. ISSN No. 0026-7295.

CONTRIBUTIONS: To authors, photographers, and people featured in this magazine, all materials published in *Model Airplane News* become the exclusive property of Air Age, Inc., unless prior arrangement is made, in writing, with the Publisher. The publisher assumes no responsibility for unsolicited material. Only manuscripts and supporting material accompanied by a SASE will be returned.

ADVERTISING: Advertising rates available on request. Please send advertising materials, insertion orders, etc., to Advertising Dept., Air Age, Inc., 251 Danbury Rd., Wilton, CT 06897. Phone: 203-834-2900. FAX: 203-762-9803.

CHANGE OF ADDRESS: To make sure you don't miss any issues, send your new address to Subscription Dept., *Model Airplane News*, P.O. Box 428, Mount Morris, IL 61054, six weeks before you move. Please include the address label from a recent issue, or print the information exactly as shown on the label. The Post Office will not forward copies unless you provide the extra postage. Duplicate issues cannot be sent.

POSTMASTER: Please send Form 3579 to *Model Airplane News*, P.O. Box 428, Mount Morris, IL 61054.

The Glow Plug Analyzers!

The metered NI-STARTER® from McDaniel R/C analyzes the condition of your glow plug each time you use it to start your engine. When attached, the dual-face ampmeter indicates a good, marginal or failed plug. *Another innovation from McDaniel R/C.*

- 1650 ma/hr rechargeable battery provides 35% more starting power than regular nicads.
- Dual-face ampmeter indicates plug condition when attached.



Model 205 shown,
Model 201 w/charger

**NEW
Helicopter
Version**

Model 218 shown,
Model 217 w/charger

- .020" wall stainless steel tube, stainless steel spring, direct connecting high temp. teflon wiring with beryllium copper electrode. No sliding contacts to corrode.
- Positive 6-point **PlugLock™** will not strip or wear out.
- 110V and 220V AC chargers available.

For these and other fine products from McDaniel R/C, see your local hobby dealer or contact:

McDaniel R/C Inc.
12206 Guinevere Rd., Glenn Dale, MD 20769
(301) 464-2260 FAX (301) 262-4433
Visa and MC accepted.

We take the hassle out of the hobby!

NI-STARTER® Patent #D72901 & 4,405,890 PlugLock™ (Patent Pend.)

NI-STARTER® is a reg. trademark of McDaniel R/C, Inc.

Airwaves

Advice to the Airborne

I'm interested in R/C planes and I want to get started in the hobby. I've read a lot of your articles, so I thought you could answer my questions: What trainer would you recommend to a beginner, and what engine and radio would you recommend for that trainer?

MATTHEW VEGA
Boise, ID

Matt, see our answer to Scott elsewhere in this column. Hope you enjoy this issue!

RAU

I'm interested in getting started in R/C—primarily aircraft—but I'm not exactly sure what to do. I've been reading your magazine for the past couple of issues and I'm truly impressed.

This is something "down the road" for me, but my ultimate goal is to build and fly a Boeing B-17. My uncle piloted one over Germany in 1944 and his experiences thrill me to no end! Do you know of plans, or a kit, for a B-17G, powered by a .45- to .60-size engine?

With so much information available, I don't know what to select or whom to really believe. What are your recommendations at this time? I realize your time is limited, but any assistance will be greatly appreciated! Looking forward to hearing from you.

SCOTT SPENCER
Starkville, MS

Scott, I enjoyed reading your letter because, in addition to appreciating your kind words about MAN, it really does reflect the typical newcomer's problems. I can appreciate some of the confusion you feel; we've all experienced it when we were starting, but there couldn't be a better time to get involved than right now—we've got more entry-level airplanes, more attractively priced, high-reliability radios, better engines and a huge selection of after-market accessories.

As far as recommendations go, I would first advise you to visit your local hobby shop, tell them you're a beginner

and ask for their suggestions. Then ask where the local club flies and visit the field. Observe the types of planes being flown by the newcomers and ask more questions. Most R/Cers are a friendly group who are willing to share their experiences, and they'll probably be the best source of guidance.

Magazines are also a good source; for example, this issue features a number of popular beginner airplanes as product reviews, along with other material that we hope will be useful to the many modelers, like yourself, who are interested in R/C flying.

Your "down the road" goal of a B-17 is great. To keep things in perspective, though, ask your uncle how many hours he had on other, less complicated airplanes (like PT-17s and T-6s) before he flew the B-17. Try to "fly" a similar modeling course. It will take time, practice and concentration. The only B-17 as large as the one you describe that I recall was made some time ago by a company called Wescraft. As far as I know, it's no longer available. However, Royal Products does make a smaller version which might suit your requirements. Good luck and welcome to R/Cing!

RAU

How smooth should the landing strip be? Also, could you suggest a less expensive gas plane for a beginner?

I started reading your magazine recently and enjoy it. Keep up the good work!

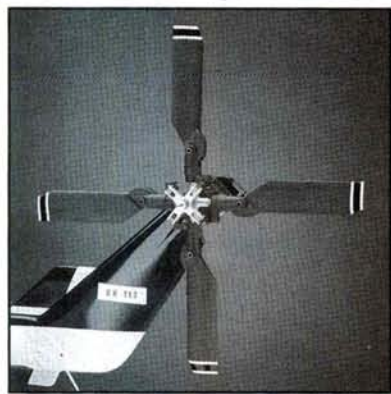
TOBIAH COFFMAN
Dunkirk, IN

Tobiah, the smoother the better, but close-cut grass is probably best all-around; there's less damage than on hard ground or on a runway (concrete or black top) after a crash, especially important to the beginner! Glad you enjoy MAN, we hope this issue is helpful; it was put together for people like you, Scott and Matthew.

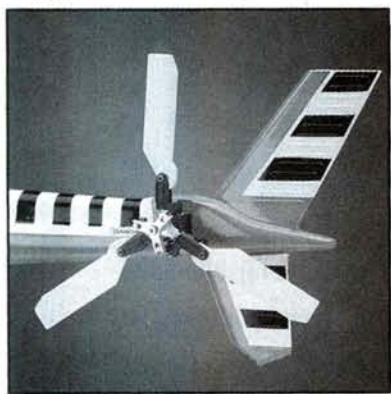
RAU

(Continued on page 10)

MULTI BLADE TAIL ROTORS



Add scale realism and greatly improved tail rotor response to your R/C helicopter. DR. J's new 3 or 4 blade tail rotor kits include easy-to-follow instructions, precision machined hub and pitch plate. Suggested retail: \$139.95



Multi Blade Tail Rotors are available for most Schluter, GMP and X-Cell helicopters.

DR.J's also stocks any additional parts necessary to complete a Multi Blade Tail Rotor to your specifications.

DR. J's
West Coast
Hobby
Warehouse

For Prices & Info.
(805) 949-3586-Mark Smith
ORDERS ONLY: (800) 622-2092
Dealer Inquiries Invited.

Airwaves

C-3 Search Ended

When I wrote last August asking if you had the Hobby Shack Aeronca C-3 plans in your archives, I really didn't expect that you would publish my letter (MAN Sept. '88), nor did I expect the overwhelming response I received. Not only did I get the plans along with the building instructions, but also plans for different versions of the early Aeroncas, scale details that included nut and bolt sizes and color schemes—even details of the early engines! To top it off, I got a call from Steve Pfister in Santa Paula, CA, who offered me a ride in a restored C-3, if I ever got out his way.

My thanks to respondents George Lounsbury of Escondido, CA, Wilbur Absher of Topeka, KS, Brian Smith of Ontario, Canada, and special thanks to Ross Summers of Ft. Washington, MD, whose letter arrived first with the plans and instructions. They are modelers all and really a bunch of good guys!

The thought crossed my mind that some of our federal investigative agencies could use a few lessons from you folks. Again, many thanks for your consideration.

DON ERTEL
Venice, FL

Thanks Don, I don't know if we'd have been quite as successful if you had asked for drawings of the space shuttle! The drawings, maybe... the ride, not likely!

The important thing to remember is that our readers, the modelers, responded; we only provided the medium. Glad we could help!

RAU

Non-Edible Gyro

I am looking for a kit or plans for the Autogyro and thought you might be able to help me. Scale or off-scale is OK—at this point, I'm not being very picky! If you know of any such kit or plan, please let me know. Thank you!

ROBERT BURROW
Wichita, KS

Bob, since I don't know of any autogyro kit, let me suggest our plan No. 296. Designed by Hal deBolt, it's .40-powered and should provide you with some autogyro fun. Best of all, the plan is only \$7, plus postage!

RAU

Wilga Flying When the Weather Clears!

In the Airwaves section of your October '88 issue, Sean Tellez from Lomita, CA, wrote asking for information on the PZL 104 Wilga.

Here's a photo of my PZL 104 Wilga 80 when I picked it up from the North American distributor in Peterborough, Canada. I can answer one of Mr. Tellez's questions: The address of the distributor for this country is Air Tech Canada, Peterborough Municipal Airport, P.O. Box 415, Peterborough, Ontario, Canada K9S 6Z3; Telephone: (705) 743-9483.

I didn't realize there was already an R/C model of the Wilga. My only hope is that it's easier to fly than the real thing, which is definitely a tail-dragger, and the CG is rather high, because all the fuel is in the wing. No one needs to duck his head to walk under it. The result is that you'd better be on your toes for takeoffs and landings! Otherwise, it's a pussycat.



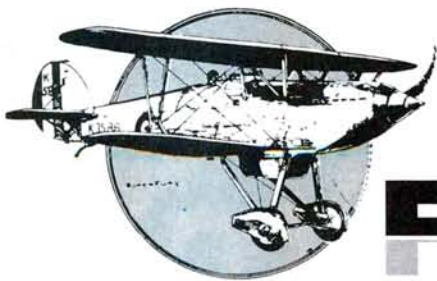
If Mr. Tellez would like to write to me, I can furnish him with pictures of my Wilga. Hopefully, he'll learn more about the work that has already been done on an R/C Wilga.

Parachuting is what we do here at my little country airport, and that's what I bought the Wilga for. I'm looking forward to flying it on the snow this winter. The skis are retractable and weren't in the way this summer, so until I get more used to the airplane maintenance-wise, I'm leaving the skis on. The skis are raised and lowered by the same compressed-air system that's used to start the engine.

ROBERT CLUPPER
Mentone Airport
RR 1 Box 269
Mentone, IN 46539

Is there still anyone out there who thinks that not many modelers are full-scale pilots and vice versa? The nice part is that the camaraderie transcends size difference.

RAU



Fifty Years Ago...

by STEVE POND



WITH THE LONG-awaited arrival of old Saint Nicholas, the advertisers in the December 1938 edition of *Model Airplane News* geared up for the holiday season with ads targeting those who thought of giving the gift of flight. Holiday specials included a number of gas-powered kits from Megow's, e.g., the Bassett Cardinal, Quaker Flash and the Flying Quaker—for under six dollars! Another well-known distributor in the '30s, Reginald Denny, had the usual specials on airplanes, his own engines and even a gas-powered car called the "Straightaway King." This early model car consisted of a drilled-steel frame, cutout metal body, metal wheels with rubber tires, formed axles, springs and tie rods. Powered by a 1/8hp engine, the car was reported to go more than 45mph!

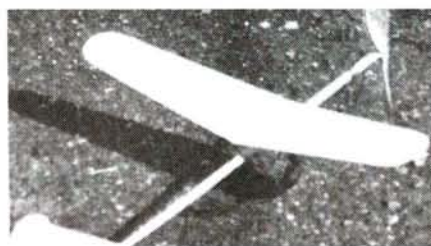
Model Airplane News was also in the holiday spirit with a subscription offer of only \$1.50 for one full year, plus a free gift of either a Fairchild Cabin or a Howard Ike 20-inch flying model. A construction article in the December issue was for the Cloud Chaser, a rubber-powered stick plane that was designed with the beginner in mind. The cost of building was considerably lower than that of the scale planes, or even those with a fuselage. Although it was rather large for

a beginner's rubber-powered model (with a 30-inch wingspan), it was every bit as good as a smaller plane when it came to flight performance, and its larger size had the added bonus of a little weight for smooth, sturdy flight.



The 208mph German seaplane with retractable wing floats for non-stop North Atlantic service.

In the world of full-scale aviation, the new generation of aviation scientists (or aerodynamicists, as they were often called) had the word "impossible" stricken from their vocabulary, and they hammered away at some of the most puzzling roadblocks on the path to success—and success came in many



Bruno Marchi's Cloud Chaser featured twin fins and a large stabilizer for very smooth, stable flight.

forms. For some, it was the largest transport, for others, it was the fastest craft in the sky, while others leant towards military craft with an obvious goal in mind.

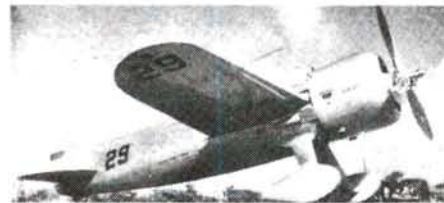
Regardless of which path was chosen, there was a common goal: to achieve flight in the most efficient manner possible. The National Air Races were the greatest forums for testing new airfoils, retractable landing gear, more efficient engines and an endless list of other improvements. Some of the more prominent names included Art Chester, who flew the Goon to take second place in the Greve Trophy Race, and Roscoe Turner in the Laird Special, powered by a whopping 1050hp Wasp engine.

"Frontiers of Aviation," a column in

Model Airplane News dedicated to full-scale aviation, featured the more significant advances in aviation, and December's column was no exception. For non-stop transatlantic service, Germany had introduced its new streamlined seaplane

that featured retractable wingtip floats. Instead of having four engines on the leading edge of the wing, the German plane had two mounted in the standard location and two others directly behind them, working as pushers. The rear engines could be raised a maximum of 10 degrees to avoid water spray during taxiing.

While the German plane was quite impressive, the Americans weren't to be outdone. Granted, the German seaplane was a good-looker, but the Americans set



Roscoe Turner's Laird Special with a Wasp 1050hp engine with which he won the Thompson Trophy.

out to prove what their mighty version was capable of. With a gross load of 77,500 pounds, America's new Boeing Clipper set a new American record for the heaviest airborne cargo plane.

While some of the features that date back 50 years may seem insignificant when compared to those of today's high-tech aircraft, consider the foundation that was laid by these fearless, relentless pilots and engineers. And just as they were there for aviation, *Model Airplane News* was there, as it still is, to bring you the most up-to-date information in model aviation. ■



KADET SENIORITA

TWICE A TRAINER—BUILDS LIKE
A REAL MODEL, FLIES GREAT



by RALPH CLOUD

THE KADET SENIORITA is Sig's* latest addition to its line of Kadet kits. With a 63-inch wingspan, it's a compact version of the Kadet Senior, which spans 78 inches. The Seniorita's construction is almost identical to that of the Senior, so it has a similarly light, yet strong, airframe.



Although scaled down, the Seniorita is still large enough to be visible at a distance by a student pilot. Like the Senior, the Seniorita is also controlled with two to three channels (rudder, elevator and throttle).

The balsa wood in the kit is of good-to-excellent quality: die-cut ply, balsa for ribs and printed balsa sheets for thicker parts. The hardware package contains pre-bent landing-gear wires; aluminum rail-type engine mounts; a nose-wheel bracket with steering arm; a windshield and side windows; a decal sheet;

SPECIFICATIONS

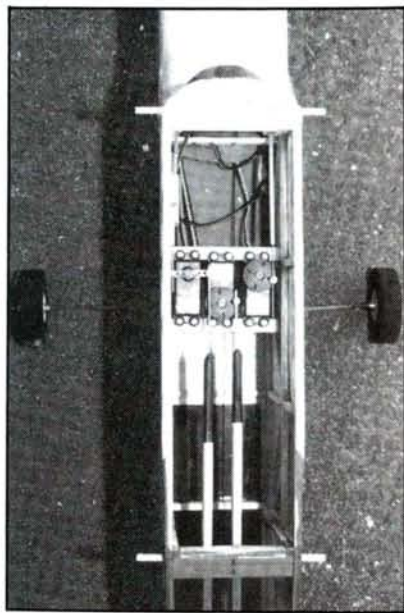
Type: Basic trainer
Wingspan: 63 inches
Weight: 3½ to 4 pounds
Wing Area: 746 square inches
Wing Loading: 11 to 12½ ounces/square foot
Power Required: .15 to .25, 2-stroke; or .21 to .35, 4-stroke
Number of Channels Required: 2 to 3
Suggested Retail Price: \$49.95
Features: Built-up balsa construction, full-size plans and photo-illustrated building manual. Extensive hardware package.

Sig Easy Hinges; control horns; fiberglass reinforcement for the wing center section; blindnuts; screws; nylon R/C links; and threaded rods.

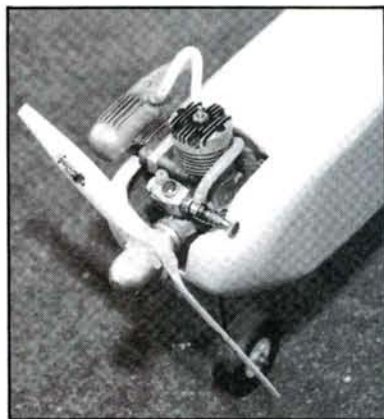
The full-size plans are printed on two folded sheets. The 38x50-inch sheet shows the top and side views of the fuselage, several cross sections of the fuselage and one wing panel, while the 25x38-inch sheet shows the other wing panel, a view of the stab and elevator, and dihedral and wing-tip-angle templates.

A preliminary look at the plans and instruction manual showed that construction sequences were fully explained. There was also some helpful information on radio installation, control linkages (information that's vital to someone unfamiliar with connecting control rods to servos) and general information on building techniques. Most important (and unusual in a kit) were some general guidelines on building, including advice on radio equipment and engine size. Also included was an answer to the old

question about printed parts: "Do I cut *inside* the line, *outside* the line or down the *middle* of the line?" Sig's answer? "Leave the complete black line on the printed part." In addition to the instruction manual, the kit also



Cavernous radio compartment will accept nearly any radio—maybe even a cassette deck or CD player! Heat-shrink tube used to secure music wire to ¼-inch-square pushrods.



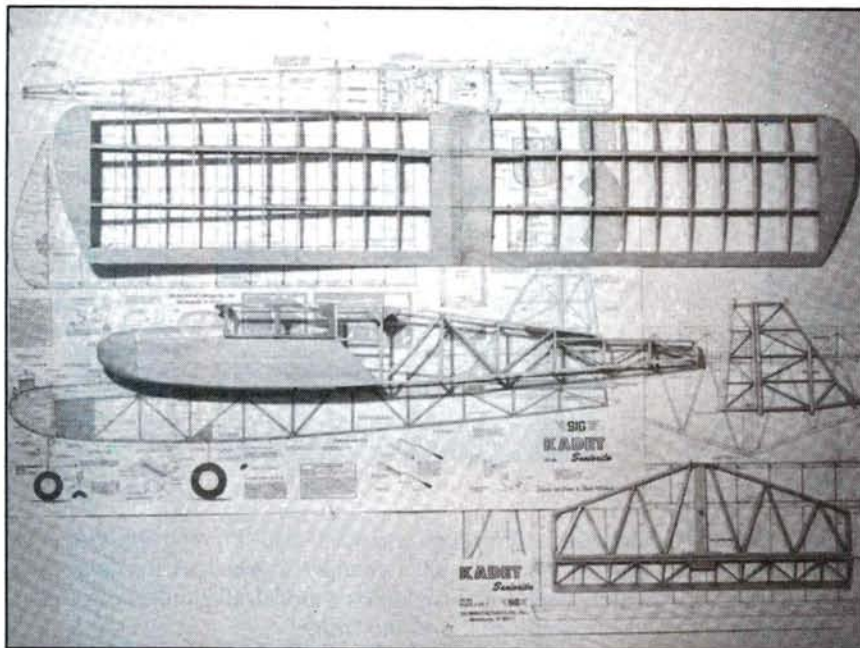
Well-used Thunder Tiger engine was used in lightweight Seniorita. Prop obviously sized to engine, not airframe. Note pressure line to muffler.

contains a "Pre-flight check list" and "Piloting tips for first flights." This pamphlet contains instructions for doing a safety check of the completed model, and information on control-surface throw and flying.

CONSTRUCTION: This begins with the wings and then the tail surfaces. The instruction manual referred to some pieces by the length needed. You'll have to refer to the parts list, check the size of the wood, and determine if trimming is required. Don't cut a piece before making sure it's the correct piece. (I'll address this problem later.)

WING: The construction of the wing is relatively simple and is explained thoroughly in the manual. Be sure to trial-fit all parts; the quality of the die-cutting is good, but some parts may need trimming before gluing. My kit lacked one wing spar, so I contacted Sig and was advised that the error had been detected and corrected. The wing construction uses a top and bottom main spar, an upper and lower rear spar, shaped and notched trailing edges, and a square leading edge and sheer webs on both main and rear spars. The wing tips are built up using a printed balsa sheet for the bottom and 1/16-inch balsa sheeting on top. The center section is sheeted, and top and bottom plywood doublers are used on the main spars. The center sheeting is reinforced at the wing joint with fiberglass cloth (supplied). Templates are printed on the plans for the wing-tip angle and dihedral, and this really helps to make the job easier.

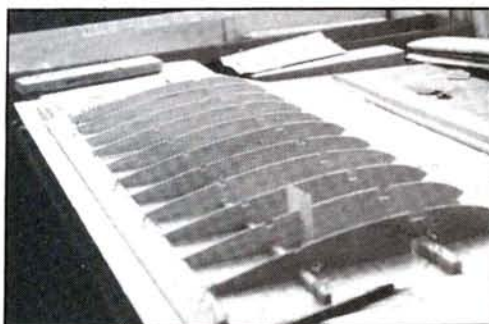
FUSELAGE: The sequence the manual follows goes from the wing to the fire wall. Because the fire wall is necessary for fuselage construction, this seemed the most logical time to install it. Your only major decision when constructing the Seniorita concerns the fire wall. You must decide if you prefer to build in right thrust or not. The instruction manual provides guidelines for both methods of construction, allowing you to use right thrust if you're comfortable with the more complicated directions. The fuselage is built up of 3/16-inch-square balsa and spruce.



The completed framework. Full-size plan ensures accuracy. Nothing like open framework! A builder's kit.

The manual seems deficient at the beginning of the fuselage construction. The first step simply says, "Soak the front end of the bottom $\frac{3}{16}$ -inch-square fuselage stringer in water so that it may be more easily pinned into place on the plan in the curved part at the front. Add the other lengthwise stringers of spruce and balsa. Glue in FN. Install the vertical $\frac{3}{16}$ -inch-square balsa uprights. Put in the $\frac{3}{16}$ -inch-square diagonal braces." This covers most of the fuselage construction, but unfortunately, the plans aren't really clear on where the spruce and balsa go. Look closely at the plans before you cut any wood. This same step doesn't mention that the spruce cabin top pieces are precut for you. Before realizing they had been precut and were listed in the parts list, I cut them from the 36-inch piece of spruce. Check the parts list, or you may pick the wrong piece for the job.

After building one side of the fuselage, the second side is built over the first, and they're separated by plastic wrap or wax paper. There are a few parts the instruction manual doesn't discuss; look at the pictures in the manual and also at the plans to ensure that all the parts are properly located. Specifically, I found that installation of part G-2 (the gusset for



Traditional, built-up balsa wing. Constant chord means easy, true assembly providing flat building surface used. Note device on second rib, used to ensure rib is vertical to surface before gluing to spar.

the rear wing-down) isn't directly addressed. Also, the front, top cabin cross-piece is shown on the plans, but the instruction manual doesn't mention it.

EMPENNAGE: Using a stick construction, I had no trouble with the stab and elevator. However, I found myself short of balsa again, so thinking I might have planned my cutting wrong and was leaving too much scrap, I measured each length, and then added my measurements. My total was 79 inches of $\frac{3}{16} \times \frac{5}{16}$ -inch stock. The kit provided only two 36-inch lengths; total: 72 inches. See the problem? How-



Ralph proudly poses with this newly completed Seniorita. Stern look shows unnecessary trepidation; first flight was perfect!

ever, the manual discussed the construction thoroughly, and the completed structure was strong and light. The elevator trailing edge was pre-shaped and notched, and the crosspieces were die-cut to the proper taper.

The fin and rudder construction was again built up using stick construction. My only problem was a discrepancy between the plans ($\frac{1}{4}$ inch square) and instructions ($\frac{5}{16}$ inch square) concerning the size of the rudder leading edge. I resolved the problem by looking at the parts list and finding that the correct size was $\frac{1}{4}$ inch square. The rudder construction was similar to that of the elevator.

Despite the minor problems on the empennage, it's an easily built, light, strong structure.

(Continued on page 50)

720 transmitter; very good buy for its advanced features.

THIS MONTH, I'LL REVIEW Polk's Model Craft Hobbies'* Aristo-Craft Hi Tech Challenger—a 7-channel digital proportional FM radio system. Manufactured in Korea, it has many new features, the most significant of these being that it meets 1991 standards. The results of my extensive laboratory testing will appear in this review. The 720 system includes full Ni-Cd transmitter and receiver battery packs, charger and three servos, at an unbelievable price of \$170. Additional servos sell for \$12, transmitter modules are \$25 and a matching receiver is \$30. Here's a more detailed look at the set's features:

Transmitter: Challenger 720

- Deluxe body, specially designed for greater operability.
- New, accurate, smoothly operating control sticks.
- Control-stick length and tension adjustment.



by CHARLIE KENNEY

CHALLENGER 720

REVIEW

- Travel of the throttle control stick is adjustable.
- Easy-access servo-reversing switches for all channels.
- Aileron and elevator dual rate.
- High-efficiency 10-section telescopic antenna.
- Elevator-flap mixing.
- Rudder-aileron mixing.
- RF power-output meter.
- Battery-check button.
- Neck-strap connector.
- Charger connector for optional Ni-Cd batteries.
- Specially designed battery pack for Ni-Cds.
- Quick-change frequency module.
- Electronic trim adjustment.

Receiver: Challenger HP-7RM72F

- Dual conversion for effective image rejection.

- Narrow band width meets 1991 standards.
- Dual-gate field-effect transistor RF amplifier.
- Squelch circuit.
- Voltage regulation.

- Locking-type anti-vibration metal-plated terminal connectors.

Servo: HS-402

- Indirect drive for gear-train protection.

- Water-resistant.
- High-impact case.



Full-up 720 system out of the box.

TRANSMITTER: Challenger 720

Operating System: 2-stick system

Transmitting Frequency: 72MHz (all). Reviewed unit 72.630MHz, Channel 42 yellow red

Module Change System: Precision module that permits frequency change within the same band (72MHz)

Modulation System: FM (frequency modulation)

Power Supply: 10.8V DC (nine Ni-Cd batteries)

Current Drain: 150mA at 10.8V

Dimensions: 7.5x6.5x2.5 inches

Weight: 2 pounds, 2 ounces

RECEIVER: HP-7RM72F

Receiving Frequency: 72MHz

Crystal Change System: Precision crystal that permits frequency change within the same band (72MHz)

Intermediate Frequencies: 10.7MHz and 455kHz

Power Supply: 4.8V (four Ni-Cd batteries)

Current Drain: 30mA (quiescent)

Dimensions: 2.3x1.6x0.8 inches

Weight: 1.5 ounces

SERVO: HS402

Control System: Positive-pulse width control (1.55 ms neutral)

Operating Angle: 45 degrees either side of neutral

Power Supply: 4.8V (four Ni-Cd) AA size

Current Drain: 6.4mA at 4.8V (neutral)

Output Torque: 42 ounces/inch

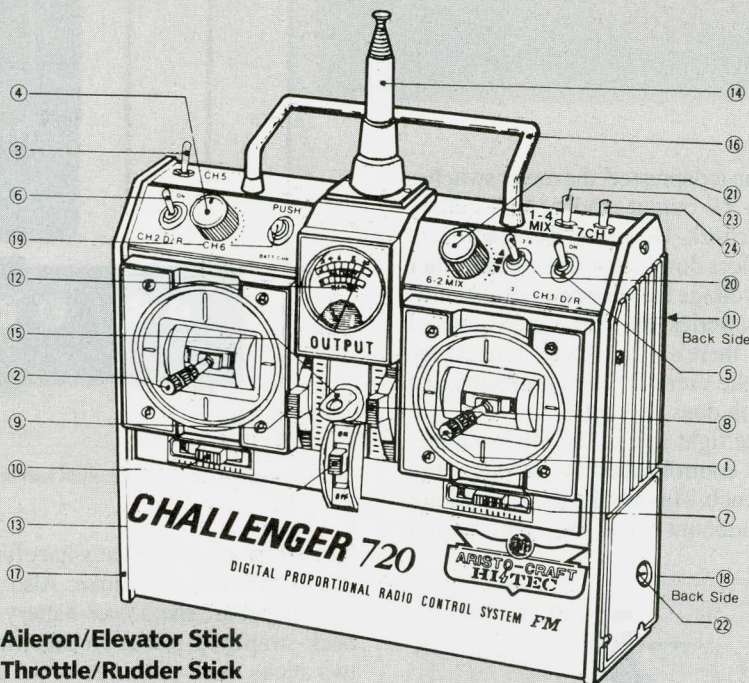
Operating Speed: 0.24 seconds/45 degrees

Dimensions: 1.8x0.8x1.8 inches

Weight: 1.7 ounces

The transmitter case is constructed of brushed gold-colored aluminum and black plastic, and the transmitter is light and easy to hold. Let's look at the controls, starting at the top left. First is the Channel 5 switch and it's usually used for landing gear (On is forward; off is rear). Next to the Channel 5 switch are the carrying handle and the 42-inch 10-element telescoping antenna.

On the upper, slanted portion of the front panel are the special controls: From left to right are the Channel 2 or elevator dual-rate (D/R) switch (the forward switch position is on, reverse is off), the Channel 6 Control Set for flaps (a 41-click ratchet pot that can also be used with the elevator-flap mixer when the elevator-flap mixing switch is on) and the battery "push-to-check" button. (When



1. Aileron/Elevator Stick

2. Throttle/Rudder Stick

3. Landing-Gear Switch.

Used to lower and retract the landing gear with a landing-gear servo. Also used as the gyro output selector switch for the 6-channel and 7-channel.

4. Flap (pitch) Knob

Used as the flap or spare channel (CH6). Equipped with a 41-click ratchet. Sets the elevator to flap (CH6) mixing amount and direction when the elevator-flap mixing switch in "ON." Mixing amount range is 0 to 100 percent.

5. Aileron Dual-Rate (kick-up and kick-down and trimmer) ON/OFF Switch.

The aileron rudder range can be arbitrarily set. When the switch is OFF, the rudder angle is normal and when it is ON, the rudder angle is set with the trimmer. Rudder angle adjustment range 40 to 100 percent. Dual-rate trimmer is contained in the back panel.

6. Elevator Dual-Rate (kick-up, kick-down) Switch and Trimmer

Arbitrarily sets the elevator rudder angle. Rudder angle is normal when the switch is off and can be set within the 40- to 100-percent range when it is ON. Elevator dual-rate trimmer is also located in the back panel.

7. Aileron Trimmer

8. Elevator Trimmer

9. Throttle Trimmer

10. Rudder Trimmer

11. Transmitter Module (back side)

12. Round Level Meter/Battery Meter

Indicates the transmitter power supply voltage and output (power meter).

13. Power Switch

14. Rod Antenna

High-radiation-efficiency, 1190mm lockable antenna.

15. Neck-Strap Connector

16. Handle

17. Body

18. Reverse Switch (back side)

Located in the back panel lower right.

19. Battery-Check Switch

20. Flap (6-channel) Knob (Elevator-flap mixing ON/OFF/ON switch)

Ratchet knob that sets the elevator to flap mixing amount and direction when the elevator-down mixing switch is ON.

21. Elevator Trim Down Mixing Knob

Sets the flaps (CH6) to elevator mixing amount and direction when the elevator-down mixing switch is ON.

22. Recharge Jack

23. 1 — 4 Mixing Switch

In some sets, may be located on back panel

24. Channel 7

the button is depressed, the meter switches from an RF output reading to a battery voltage check. However, the needle will only deflect downscale if the transmitter battery voltage has dropped significantly. If the batteries are in a good state of charge, there's no needle movement, leaving the user with the impression that the button does nothing.)

On the right side of the top is another 41-click control called the elevator-trim mixing knob. This sets the flap-to-elevator mixing amount when the flap-elevator



Transmitter back: Note fuse, battery connector lower left.

switch is in the 6-2 mix position, or the elevator-flap switch is in the 2-6 mix position. The flap-elevator mixing switch is to the right of the elevator mixing knob. This switch controls the aforementioned mixing with the neutral switch position being off/on elevator-flap mixing. The next control on the upper right side is the aileron dual-rate switch (on is forward). Above the Channel 1 aileron D/R switch is the Channel 7 on/off switch. This may



Transmitter controls: dual rate and mixing on left; servo-reverse switches on right.

be used for any desired auxiliary function, like bomb drop or smoke. Also on the front panel are the power-battery meter, neck-strap loop, power on/off switch and two sticks. Both sticks are of the closed-gimbal design and operate smoothly. The length of the sticks is adjustable by 1/4 inch. Mode II configuration is employed, with motor and rudder on the left stick and aileron and elevator on the right. Electronic trim controls are employed.

The rest of the transmitter controls are on the rear under a removable cover. I'll describe them in order, left to right. By turning the control clockwise on the Channel 1 aileron dual-rate trimmer, you can vary the aileron throw from 100 percent to 40 percent when the aileron D/R switch is in the on position. The elevator dual-rate trimmer operates in the same fashion as the aileron dual-rate control. When the aileron-rudder mixing switch is placed in the on position, aileron and rudder move together from the aileron stick. I noted that with this switch on full aileron and rudder servo, travel is reduced by about 40 percent. (This ratio is not adjustable.) The 2-6 mixing control allows you to set the amount of elevator you want with a given flap movement. To

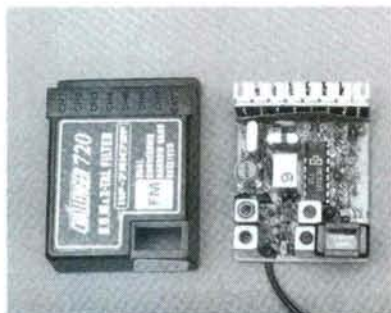
adjust this, the elevator-flap mix switch on the front panel must be set to the 2-6 position. The flap volume control allows the desired adjustment of flaps with the elevator. The remaining controls are the six servo-reversing switches where down is forward and up is reverse throw. There's a charging jack on the lower right side, which is used for charging the Ni-Cd batteries.

The Challenger 720 is truly a 1991 radio system. I checked the 720 transmitter on a Hewlett Packard spectrum analyzer and photographed the results shown here. The operating frequency was measured at 72.6299MHz, Channel 421. The ordinate was calibrated to 50kHz, or 5kHz per square. The abscissa was calibrated to be 2dB per square for a dynamic range of 20dB. As may be seen from the output signal (the tallest one), the 3dB band width (3dB down from the peak of the signal) is about 2kHz wide (well within the 10kHz frequency band required by 20kHz channel separation). Also, the output signal is very clean. The only thing my 720 systems are missing is the gold sticker that certifies 1991 performance, and I'm sure that this will be remedied in the near future.

The Hi Tech Challenger 720 is a class 7-channel radio system with many desirable features. It's well made, and the two systems I own have performed flawlessly in two aircraft. When you plan to buy your next radio, take a look at the Challenger 720; the price is right.

**Here is the name of the company featured in this article:*

Polk's Model Craft Hobbies, 346 Bergen Ave., Jersey City, NJ 07304. ■



HP-7RM72F doubled tuned receiver; two RF crystals and 8-pole crystal filter.



720 Ni-Cd transmitter pack, receiver pack and charger.

Hints & Kinks

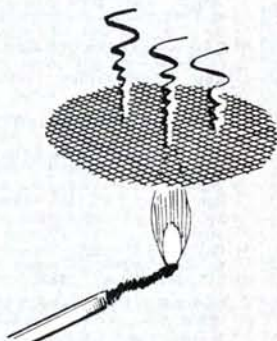
by JIM NEWMAN



POSITIVE DEPTH STOP

To ensure exact depth when drilling blind holes, fit an appropriate-size wheel collar to the drill as a depth stop. This is far more precise than a piece of masking tape or fuel tube around the drill. Be sure that the setscrew is firmly tightened so that the collar can't slip and alter the setting.

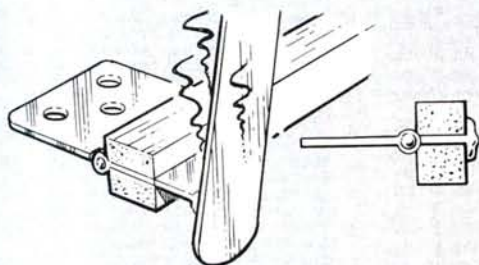
Oscar Fiordelisi, Buenos Aires, Argentina



FUEL-FILTER CLEANING

If the filter screen is of metal and the debris it has trapped resists the usual method of cleaning, use a lighted match to burn it out of the screen. Afterwards, a quick rinse and a light scrub with an old toothbrush will restore it to new.

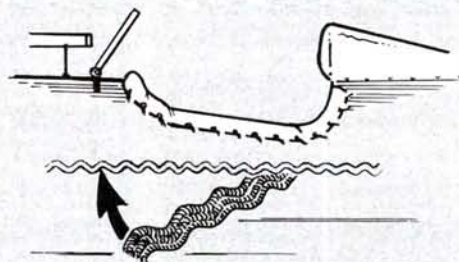
Richard R. Smith, Rome, NY



SECURE HINGES

Instead of using the usual pins or toothpicks to "rivet" hinges in place, use a hot, flat strip of metal (or a knife blade) to melt the plastic into a blob as shown. This will never pull out.

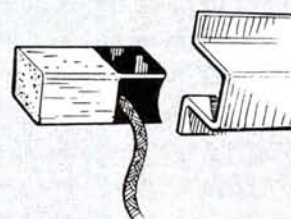
Doug Horne, Ottawa, Ontario, Canada



FAKE FABRIC LACING

Here's a really simple way to simulate lacing on early fabric-covered airplanes. After priming (but before painting), glue dressmaker's zigzag rickrack in place. This is available at the notions counter of the dime store, and, once in place, the effect is startling. You should see this modeler's Boeing F4B!

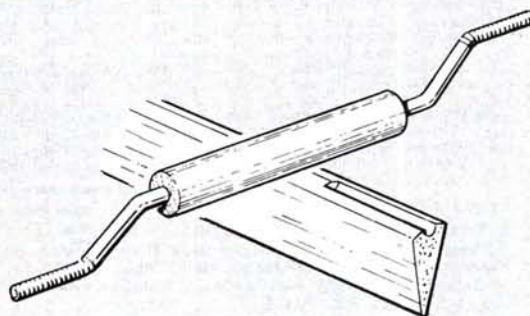
Dan C. Lutz, Fallbrook, CA



EMERGENCY BRUSH REPAIR

In the middle of a flying session, this flier found that his motor brushes were so worn that they would no longer touch the commutator. As a temporary remedy, he glued balsa blocks to the brushes so that the springs could once again push them into contact.

Don Grimes, Eaton, OH



GROOVING TOOL

Bend two different-size machine screws (e.g., 4-40 and 6-32), cut off their heads, and glue them into 4 inches of dowel. (The screws should be 2 inches or more long.) This is useful for scraping out grooves for aileron torque rods and wire elevator joiners.

Walter Bellmer, Franklin Square, NY

Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send rough sketch to Jim Newman, c/o Model Airplane News, 251 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.

Sporty Scale Techn

The Messerschmitt BF-109 from the Dave Platt kit is an example of the type of accuracy you can maintain, if you start with the proper drawings.



"PCM: PICK, CHOOSE, MATCH"

by FRANK TIANO

THIS MONTH'S COLUMN was prompted by a discussion with a rather prominent modeler. We now have some ideas why certain modelers consistently do better than others in the static portion of contests. I'm talking *any* contest here, whether it's a local one or a full-blown national affair like the Top Gun Invitational. It seems that many of us build our favorite scale airplane, add all the necessary details to make it look good, and then look for a color scheme. Well, I'm really sorry to have to tell you, but this practice is very wrong, taboo and not at all good! It's akin to building a race car, gearing it so that your maximum performance is realized on a one-mile track and then looking for the track! What a pity, when all you can find are 1¼-milers and your car craps out 14 seconds too early!

I'm trying to make a really simple point: Pick a subject you'd like to build, choose a particular model of that subject, match a three-view drawing to your model and go from there: *don't* change in mid-project.

There are differences between the various versions of an aircraft, and these differences may not become apparent until the final build-

ing stages, and then it's sometimes too late to make changes. For example, take one of Dave Platt's kits. You saw Charlie Chambers' gorgeous P-51, so you buy one from Dave with every intention of building a stellar model, although in a different version; you like the early Mustang—the "A" model. Fortunately for you, Mr. Platt happens to draw the early version on his plans, but if he didn't, how many of us would realize that the difference between an "A" and a "B" or "D" model isn't simply a difference in cowls? That's right: the "A" has a different nose cross-section, a different spinner, a different belly scoop, and a different canopy and wing leading edge. Panel lines are in different places and, since the plane uses a different engine, the exhaust stacks that Dave so thoughtfully provides won't do you any good. Get the picture yet?

To build this P-51A, you should first find a satisfactory three-view, or at least call the manufacturer to see if he has the one you need. If he does, buy the kit or plans, lay the three-view on the plans, and do some cross-checking to get a "scale-up" factor for your model. For instance, the wingspan of the aircraft drawn in the three-view is 9.75 inches and the span of

iques

your Platt kit is 80 inches. Simply divide 80 by 9.75 and you have 8.21. This simply means that, using a ruler marked in tenths, 8.21 multiplied by any measurement of that three-view drawing will give you an accurate scale dimension on your model. One thing is *very* important here: *Don't* change three-views midway; you just *can't* be a winner if you do. No artists draw in exactly the same way or pick up the same details on particular aircraft, and seldom do artists agree on *anything*! I've often heard a contestant complaining about his static score, and close inspection reveals that his airplane doesn't even match his own three-view. When confronted with this error, the usual response is that so-and-so *told* him to get a different drawing, because the one he was using wasn't accurate! But you're judged on *how well you matched your three-view*. Just don't present the judges with a three-view drawing in purple crayon by your four-year-old and you'll have a pretty good shot at doing OK—assuming that you measured and factored accurately.

Having convinced you that staying with one drawing is *very* important, I'll go on to the next issue. Let's assume you've picked a Platt P-51; you've decided on a "B" model and you've sorted out all the parts for that particular version. You're using the three-view provided in the kit and everything is hunky-dory. Now you look for the color scheme! Well, I'd prefer you to find the color scheme *before* you start to build the airplane, because you might love a color scheme but find that it's for a different version! However, let's assume that, in a book, you find an outstanding color scheme done by some artist. Before you dream of your fighter in that livery, you *must* be sure of a couple of things: Did the artist draw the *proper* version of the

aircraft, and did the color scheme *really* exist? Even though a photo of the subject aircraft isn't required in AMA competitions, most modelers (at least the ones with the best scores) attempt to prove the authenticity of their rendition. Thank goodness, our rules don't dictate that points be deducted if we can't prove the accuracy of our subject aircraft. These rules reflect the fact that with 38 percent of aircraft, we have only a very slim chance of finding more than one photo. There's only one known photo of Eric Hartman's famous ME-109G, and it shows only the left side, so how do you know what was on the other side? You

its construction. It's your responsibility to convince the judges that your color scheme is authentic. Artist's renditions are fine, but be sure the artist did his or her homework. Look at the artwork on the boxtop of some of the Guillows or Comet rubber-band-powered scale kits; I don't think there was ever an orange-and-brown Focke Wulf with red stripes and a green cow! If you can supply a black-and-white picture of the full-size aircraft, so much the better. Remember, however, that any outline or color details shown in the photo must be matched, even if these details aren't shown on your three-view or artist's rendition of the color scheme. A



The Macchi Folgore is one of the more attractive WWII fighters. Dave Platt's own model always scores high, due to attention to matching documentation.

could look for a description or safely bet that the other side of the airplane was painted like the side you're looking at. *MAN* editors and I agree that the Germans *didn't* paint the other side of their Messerschmidts orange with pink strips and turquoise lettering, and we're also pretty sure that the German crosses weren't painted candy-apple red!

So where does all this get us? I'll summarize: For maximum points in scale competition, you should definitely match your model to *one* three-view throughout

note to the judges saying that the artist has made a simple error as shown by the photo, and that you've taken the time to make the necessary changes will be to your advantage. Don't insult the intelligence of the judges by trying to sneak defects past them. For instance, your P-47 may have markings from April '43 in one picture and markings from June '44 in another, or you may offer two different pictures of one pilot's aircraft simply because he dorked the first one and

(Continued on page 84)

A. M. S. I M P O R T S

MODELTECH TRAINER40



NICELY PREPARED ARC,
GREAT POWERPLANT...
EXCELLENT 3-CHANNEL
BEGINNER PACKAGE

by PETER SNEDDON

FIRST LAID EYES on a trainer-type airplane about 18 years ago when I walked into an R/C pit area at Riis Park in New York. My eyes sought every sleek-looking beauty I could find, until I eventually stopped at an airplane that looked as if it were going 100mph while standing still. Without hesitation, I told the owner/pilot that this was the plane for me. His response was: "How much flying have you done?" and I anxiously told him that this would be my first plane. After chuckling, my new friend



Photos by Rich Urzutch.

SPECIFICATIONS

Type: Trainer

Wingspan: 58 $\frac{7}{8}$ inches

Wing Area: 629.5 square inches

Wing Loading: 18 to 20 ounces per square foot

Fuselage Length: 43 $\frac{3}{8}$ inches

Weight: 5 to 5 $\frac{1}{2}$ pounds



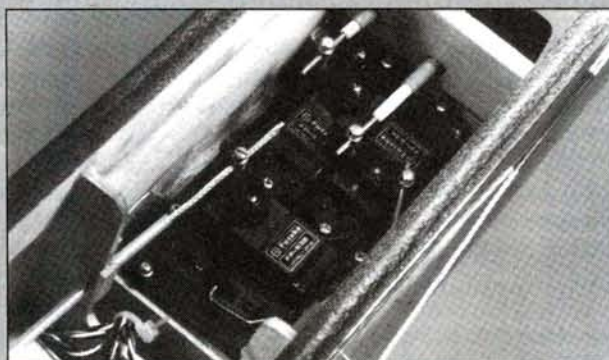
Airborne with three channels, the Trainer / ASP.40 package proved to be more than up to the task of flight training. Very gentle handling.

gave me my first lesson on flying. He told me about "trainers" and why I should learn with this type of model.

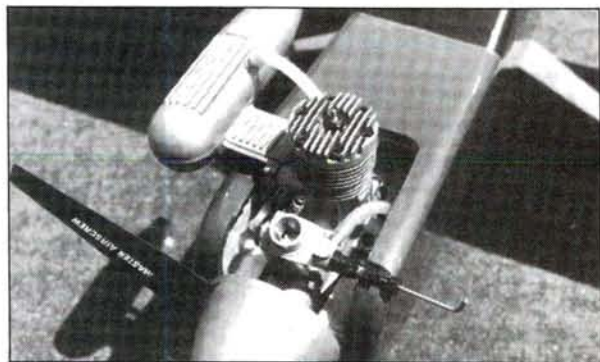
After drooling over all those pocket rockets, my initial opinion was that flying a boxy-looking high-wing job was something like showing up at a Hell's Angels meeting on a moped. I was determined to get through the training stages as quickly as possible, and, from then on, every model I built was faster and more responsive.

Some years—and many speed demons—later, I realized that trainers have a lot to offer seasoned fliers as well as beginners. From experience, I know that trainers are perfect for relaxing and enjoying the simpler aspects of our hobby. I've owned a few trainers for three seasons,

and although they'll never replace my more complex machines, they're great for getting away from tuned pipes, retracts, fuel pumps, flaps and bomb drops, and for simply cruising around the blue skies at a modest pace. Even Pitts stunt pilots like to go up in a Piper Cub every now and then.



Futaba radio installation is neat and uncluttered. Pushrod connectors used at servo end rather than at clevis or Z-bend. All three approaches work fine.



Propulsion end shows simple, straightforward installation. All linkages and lines are readily accessible for maintenance or adjustment.

The Model Tech* Trainer 40H, from the Balsa Ready-Built Series, is a 3-channel trainer using a .25 to .40 2-cycle or a .40 4-cycle engine. The 40H will adequately satisfy the needs of beginners and also entertain many sport fliers on a lazy afternoon.

CONSTRUCTION: This part of my article should be called "Preparation and Covering," because that's just about all that's necessary to get this bird off the ground. At this point, I'll remind all gung-ho beginners that an AMA license is a necessity, and instruction from a good teacher can help you avoid frustration and premature repair work.

I was impressed with the absence of any "dings" on the wooden surfaces. (These sometimes appear during manufacturing or shipping.) The well-packed kit (all 18 wooden pieces of it) consists of a pre-built fuselage, two balsa-sheeted, foam, wing halves, a built-up stabilizer and a two-piece fin. (I know that's only six pieces; can

you think of the rest?) The Trainer 40H also comes with an aluminum main-landing-gear setup, a steerable nose wheel, glass-cloth for the wing joint, control horns and a windshield sticker sheet.

The fit of the pre-assembled parts is excellent; I couldn't find any parts that weren't perfectly joined, and I looked *everywhere*. The 12-page instruction booklet covers everything, including the additional items you'll need, general assembly, film covering, linkage set-up, flight preparations and first-flight basic maneuvers.

Construction starts with engine installation, and the 40H uses a one-piece plywood engine mount and two balsa fuse doublers (that's three more wooden pieces!). The engine mount has 2 degrees of right thrust built in, as well as 6 degrees of downthrust, so it's important that the engine mount be installed properly. If you need to relieve the motor mount to fit a particular engine, take equal amounts from both sides, as this keeps the right thrust intact.

I installed a new A.S.P. .40—a Schenurle-ported, ABC engine imported from China by World Engines*. Manufacturer's specs show that the A.S.P. .40 FSR ABC (with muffler attached) turns a 10x6 prop at 15,000rpm using 15 percent glow fuel. With its flat-bottom wing, the Trainer 40H could take off at half throttle with that power. After a safe takeoff, just remember to trim your airplane for level flight *after* you've set the throttle for your desired speed. (Adding power will then require retrimming.)

The next step entails joining the wing halves. After trial-fitting the dihedral brace (W3) into both wing halves, epoxy the brace and wing panels together. (Remember that instant glues will attack untreated foam.) The W5 trailing-edge reinforcement is then added, and the wing is ready for the glass-cloth on the center section. With good results, I used a polyester resin to attach the cloth. Make sure there are no gaps between the wing panels, because if there are, the resin will attack foam also.

The wing hold-down dowels are installed when the covering is complete, but now's a good time to tell you that the plywood, inside fuse doublers have pre-drilled holes to accept the dowels. Unfortunately, you can't see the holes from the outside, so just feel for them inside the fuse, then mark them with a pin (without sticking your finger!). If the pin doesn't go all the way through, you haven't found the hole yet. Install the dowels temporarily, and attach the wing. This will help to glue the stabilizer on straight.



The ASP .40 from World Engines provides more than enough power. After a few rich break-in runs, the factory-set idle was perfect. Effective muffler supplied.

Tail surfaces are added next. The two pieces of the fin are glued together and then temporarily hinged. After temporarily hinging the stabilizer, install it parallel to the wing and square with the fuselage. Glue the fin square with the stabilizer, add the triangular R5 reinforcements, and you're ready for covering.

I used Metallic Red Super MonoKote* with the usual good results. I like to paint the engine compartment to match the covering, so I regret that I couldn't find a fuelproof paint to match this color. I didn't have to sand any part of the plane to produce a smooth finish, but I did round off the tip of the rudder. Somehow, I covered the elevator before rounding the tips, but there were no problems, so I don't think this step is absolutely necessary. The fuse was covered with an iron-on Top Flite* Hot Sock, and the result was considerably smoother than the wing. I deliberately used a Teflon-coated hobby iron when covering the wing, but no matter how lightly I pressed on the surface, the iron dug into the wing somewhat.

When the covering was complete, I installed and painted the wing dowels to protect the wood from the engine exhaust. (An exhaust deflector would work also.) I then installed a Futaba* Conquest 4-channel 3-servo system, and was very satisfied with the space provided for the radio. I beefed up the servo compartment with thin plywood to ensure a good glue joint for the servo rails.

Next, hook up the rudder to the aileron stick. (Beginners should remember that when you progress to a 4-channel airplane, you'll be steering on the ground with the left instead of the right stick.)

The instructions show two battery locations, which

(Continued on page 92)

"The Rolls Royce of Decals"

GRAPHICS

DIE-CUT • PRESS-ON • TOTALLY FUELPROOF • 5 MATCHING COLORS

WILL NOT CRACK OR PEEL

Graphics are made of 100% cast vinyl. Glass-smooth yet micro-thin. Unlike the typical mylar or water transfer decal, Graphics will not crack, peel or harden.

GOOF-PROOF ADHESIVE

Graphics have a special pressure-sensitive adhesive that gives you time to correct mistakes. During the first hour or so, the adhesive sets up slowly, allowing you to lift and re-position.

AMAZINGLY FUELPROOF

We all know how annoying it is to have fuel creep under a decal, causing the edges to curl up, and sometimes have the decal fall off. Graphics simply don't do that. See for yourself. Dip Graphics in raw fuel. Let it sit around for a few days, dripping wet. You'll be amazed to see that Graphics will still stick tight like nothing ever happened. Incidentally, no overcoating is ever required. Graphics are ready to go, right out of the wrapper.

5 MATCHING COLORS

Graphics come in 5 gloss colors: red, white, blue, black and yellow. They match our Black Baron Film, our Permagloss Coverite, and our Black Baron Epoxy paint.

GREAT FOR PLANES, BOATS, & CARS

Graphics add a professional touch to any model, including older ones. You'll be quite



pleased to see the reaction at the field when you show up with an old plane that's been dressed up with crisp, new Graphics on it. Graphics stick to just about anything: fabric, painted surfaces, plastics, metal, wood, etc. Naturally, they stick great on Coverite (Black Baron Film, Permagloss, Super & Silkspun) as well as all the other iron-ons. Since they're water and weather resistant, they're now being used on full sized boats (hulls & sails) and full sized planes (3" letters are FAA approved for tails). Not to mention signs, doors, windows, trucks, vans, etc.

STICK TO ANY CURVE








Once again, unlike traditional decals, Graphics remain pliable. Not only will they conform to any curve or angle... they will stay that way! Just press them on and forget about them. They'll stay in place for years, indoors or out, in all sorts of weather.

BIG ECONOMICAL SHEETS

Some modelers have asked us why we packaged sheets instead of individual numbers. The reason is that it is cheaper to produce a full sheet than individually packaged numbers. Examine the contents of each sheet of Graphics (described fully below) and you'll see what we mean. For example, our 1" numbers cost only 7¢ each... stars cost only 6¢ each... and stripes are only 8¢ per foot. Individually they would cost twice as much.

COVERITE
420 BABYLON ROAD, HORSHAM, PENNSYLVANIA 19044

This chart shows the contents of each sheet of graphics

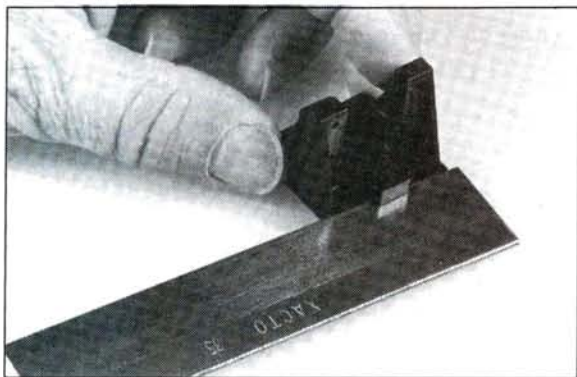
 NUMBERS	<p>This sheet contains 28 characters: 0123456789 AMA/C 0123456789 AMA/N</p>	 LETTERS	<p>This sheet contains 59 characters: ABCDEFGHIJKLMNQRSTUUVW XYZ ABCDEFGHIJKLMNQRSTUUVW XYZ A E I O A E I E</p>	 STARS	<p>This sheet contains 62 stars in four sizes: Four 3" stars Six 2" stars Sixteen 1" stars Thirty-six 1/2" stars</p>
 NUMBERS	<p>This sheet contains 28 characters: 0123456789 AMA/C 0123456789 AMA/N</p>	 LETTERS	<p>This sheet contains 61 characters: ABCDEFGHIJKLMNQRSTUUVW XYZ ABCDEFGHIJKLMNQRSTUUVW XYZ A E I O ST E I I</p>	TRIM SHEETS	<p>This sheet contains one 8" x 20" sheet. Big enough for large numbers and special designs: checkerboards, sunbursts & military insignia.</p>
 	<p>This sheet contains 28 characters: 0123456789 AMA/C 0123456789 AMA/N</p>	 NUMBERS &	<p>This sheet contains both 1/4" & 1/2" numbers & letters, with the following characters in each size: AAAABBCDDDEEEFFFGHHII IJJKKLLMMNNNOOOPPPQQR RRSSSTTTTUUUVVWWXXYYZZ &&111122223333444455556666 7777888899990000&&</p>	STRIPES	<p>3 sizes in each package: 18 feet of 1/16" 18 feet of 1/8" 18 feet of 1/4" 6 feet of random width</p>

How To:

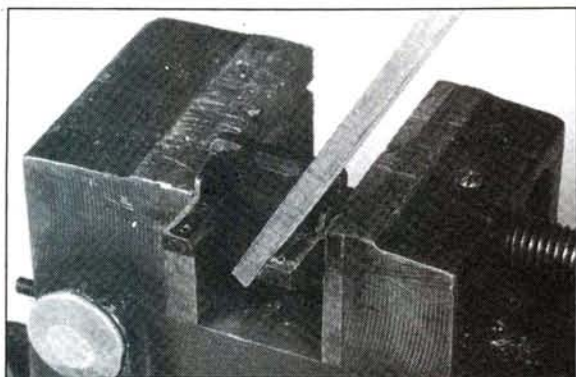
by RANDY RANDOLPH

ACE MOUNT FOR THE G-MARK

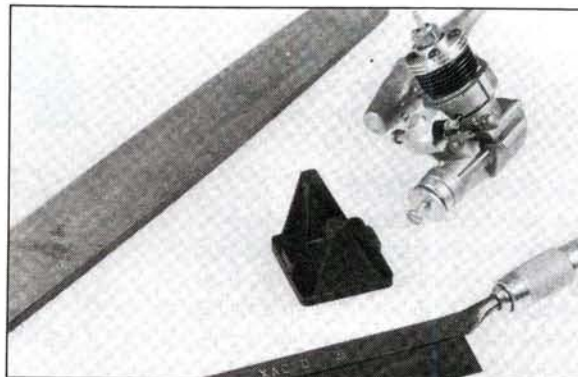
The G-Mark .061 has the same mounting dimensions as the Cox .049; however, the flanges and the crankcase are a little larger than those of the Cox. The following modification for the inexpensive Ace 1/2A mount was suggested by Bill Cannon, whose radio systems follow many 1/2A engines around the skies. The photos show the way.



2. Use the razor saw to remove the **bottom** nose-gear mounting flange. The plastic is easy to saw, if you just let the saw do the work. If necessary, use the file to dress the flange stub flush with the back-plate.



4. As shown, file a bevel on the inside of the mounting beams. A vise is helpful, but the plastic is easy to work. Extend the bevel to correspond with the trimmed area of the diagonal braces.



1. The only tools necessary to modify the Ace mount are a file and a razor saw. A vise would be handy, but isn't necessary. The **bottom** of the mount faces left, and that's where the modification takes place.



3. Once more, use the razor saw to remove the bottom diagonal braces from both sides of the mount. Start the cut 1/8 inch aft of the last mounting hole, and finish by sawing flush with the engine-mounting beams.



5. The finished mount. The mount is turned upside-down, and the engine is mounted on what would be the bottom of the rails to provide clearance for the G-Mark muffler system.

Basics of Radio Control

Which Trainer?

by RANDY RANDOLPH

A TRAINER IS A model aircraft used to teach the basic techniques of remote-controlled flight. That's a good general definition, but it doesn't take into consideration the many types of airplanes, students or instructors! In this article, I'll try to help those new to the sport make an intelligent choice of "trainer." The ideal trainer is one that fits your experience, finances and available time. These are the three most important considerations. Let's outline some choices.

Probably the quickest and most effective approach to training is that of the U.S. R/C Flight School* in Shawano, WI. The school provides airplanes and qualified instructors and has a complete ground school. Their approach isn't expensive, considering the cost of the airplane, radio and support equipment, but it *does* require at least a full week of your time, and the cost doesn't include room and board.



A few trainer kits at the Hobby Counter, Johnny Clemens' famous shop, give some idea of the number and types available.

After completing the course, students are competent enough to buy their own airplanes and equipment.



Not a crash! This is the way Almost-Ready-To-Fly airplanes leave their boxes. Assembly and the installation of engine and radio are sugar-coated modeling. These aren't the best trainers, but they'll fill the bill if competent instruction is available.

For those who can't spare the time for a flight school, but would still like to pursue the sport, several options are available. If you've had experience with free-flight or U-Control airplanes, and if you enjoy building, there's an extensive selection of good training airplanes to build and fly. A few are listed under "A" in my list of trainers. The instructions included in most of these kits are so good that prior modeling experience isn't really necessary: All you need is the desire to learn, and the ability to use simple hand tools and to follow instructions.

If you can barely remember the last balsa model plane you built (or plastic model you assembled), but you'd like to give it another try, the kits listed under "B" are just right. They're not too difficult to build, as many of the parts are prefabricated. These kits are also a good introduction to the *hobby* of building, as well as the *sport* of flying R/C airplanes.

However, not everyone wants to spend a lot of time *building*. Some of the planes in list B have considerably more prefabrication than others, and, naturally, are more expensive. Evaluate your time and funds and choose your kit accordingly.

The last category, "C", I call "ready-to-fly." These planes are as close to "out of the box and into the field" as possible. The list is short, because my aim is to list *trainers*, and there just aren't that many airplanes in this category that qualify. One of those listed is on the heavy side and therefore isn't ideal, but it could be acceptable as a training vehicle under the proper conditions, which, of course, include a competent instructor. One is actually in the toy class, but if it's properly treated and maintained, it can be a good, inexpensive trainer.

Almost without exception, trainers are high-wing, lightweight airplanes with ample wings. Although there's some debate, 3-channel airplanes (rudder, elevator and throttle) seem to be the best choice because of the stability designed into this type of trainer. Three-channel trainers rely on dihedral (the up-slant of the wings toward the tips) to bank the



Two of the best: Piece o' Cake and Monarch .05. The excellent building instructions that come with the kits in list "A" take a lot of the mystery out of model building.

LIST A

	Channels	Power
Piece O'Cake*	2-3	.049
Monarch .05*	2-3	.049
Butterfly II*	3	.10
Seniorita	3-4	.15-.20
Aero-Sport .20	4	.20
PT 20	3	.20-.25
Kaydet	3-4	.25-.40
Eaglet	3-4	.20-.25
Falcon 56	3-4	.25-.40
Aero-Sport .40	4	.40

LIST B

	Channels	Power
Dura Plane	3-4	.20-.25
Radar	4	.20-.25
Snark	3-4	.20
Sky Baby	3-4	.20
Vector	3-4	.40
Transit	3-4	.40

LIST C

	Channels	Power
RC EZ Bee*	2-3	.049
Trainer Hawk	3-4	.20-.25

airplane when the rudder control is given, and this dihedral adds stability to the aircraft. (Stability is the ability of the airplane to recover from abnormal attitudes and to re-assume a normal flight path.)

To remain airborne, heavy airplanes must fly faster than their lightweight counterparts, and the extra speed gives the student much less time to react to flight situations. Some planes with lighter loadings and lower power could be used as trainers without the aid of an instructor. (In the lists, these are indicated with asterisks.) Under *no* circumstances should you attempt to fly any of the other listed kits without a qualified instructor.

I've listed the kits of the least expensive (and usually lower powered) airplanes at the top, followed by the larger, more costly types. These lists certainly don't include *all* trainers—only those with which I've had experience.

I hope I've succeeded in showing you some of the best choices in the field of R/C training airplanes. The choices are varied and the pitfalls many. In all cases, use your best judgment after first seeking advice from active fliers, R/C club officers and hobby shop owners. Good luck!

**You can write to the U.S. R/C Flight School at 521 S. Sawyer, Shawano, WI 54166. ■*

DR. J's EASY-START!

The revolutionary new **EASY-START** utilizes the finest roller and torrrington bearings available, assuring long life and many safe, reliable R/C helicopter starts.

FEATURES:

- Slips easily into starter
- Unique rubber base assures perfect runout
- Needs no vibration-causing adaptors or cones on heli
- Will not slip off — no more broken canopies
- Removes from starter in seconds for easy transport or storage

- Available for most helicopters. Be sure to specify.

Sugg. Retail
\$39.95

DR. J's

**West Coast
Hobby
Warehouse**

For Prices & Info.

(805) 949-3586-Mark Smith

ORDERS ONLY: (800) 622-2092

Dealer Inquiries Invited.

©1988 Dr. J's West Coast Hobby Warehouse

Field & Bench Review

by BUDD DAVISSON

CAN a real
Pitts driver
find true
happiness in
an airborne
coffee cup?

THE TOWERING bulrushes blocked my path like millions of skinny ostrich legs as, cursing, I advanced through the wall of reeds, constantly watching the nearly invisible ground for signs of movement—the kind made by creatures with beady eyes and flicking tongues. Somewhere ahead lay my Cox* EZ-Bee trainer, probably unharmed, its rudder twitching in answer to the control box I still clutched in my hand. As I cursed again, I reminded myself that a sharp machete should be part of every flying kit. “Boy!” I thought, “R/C fly-



Type: Trainer
Wingspan: 55 inches
Length: 31 inches
Weight: 27 ounces
Radio: Cadet II, 2-channel
Engine: Cox Baby Bee .049 with muffler and recoil spring starter

Photos by Budd Davison.

C O X

E-Z-BEE

T R A I N E R

ing really is fun!”

So ended flight number four on my first day in the world of R/C aviation and I was having my ups and downs. I'd flown thousands of hours in birds ranging from Mustangs to ultra-lights and as many hours standing in the middle of a circle holding two lines that led to a screaming Super Tigre, but this was my first exposure to R/C. I guess it's too early to ask, “When do we get to the fun part?”

Behind this entire exercise were two goals: First, Editor

Uravitch had to retaliate for some unknown past transgression of mine and knew there was no surer way to humble a Pitts pilot who thinks he's hot guano than to put a control box in his lap and walk away. He forgets that he and I still have a Pitts flight coming up.

(Continued on page 36)



Complete Bee package includes EZ-Bee with engine and Cox Cadet 2-channel, 2-stick radio. Minimum assembly time; even epoxy is included.

The second goal was more concrete and definitely worthwhile: We wanted to see if it was practical, or even possible, for an individual of reasonably dim wits to learn to fly R/C without any coaching. We knew it could be done; we just wanted to see if the maximum frustration threshold would be reached *before* we ran out of airplanes. This, we reasoned, was also the surest way to test the training qualities of a trainer. Since, when it came to R/C, I was absolutely your average "man in the street," my reactions and observations would be absolutely average. Gee, I feel humble already!

Our first victim was the Cox EZ-Bee. The decision was based primarily on the Bee's unique control system, which has been designed to eliminate a problem all beginners have in using just enough elevator in the turns to prevent them spiralling down to a pile of styrofoam. The Bee has the usual elevator pushrod, but this is mounted on an elevated polypropylene lug that's exactly centered in the rudder servo wheel. When the servo wheel rotates, the elevator is pulled up slightly, regardless of in which direction

the rudder is pushed. This solves the graveyard spiral problem. (Supposedly, anyway!) Incidentally, the Bee we used had been around the office for some months, and it doesn't reflect many of the changes now incorporated in production models. But, at the time, we didn't know that.

We also chose the Bee for its easy construction. A slam-bang, throw-it-together model, it would let me get into the air (or into the weeds) as quickly as possible.

Before we go any further, I don't want any sarcastic comments from you people with calluses on your joy-stick finger. In the first place, I have a long-time hatred of 1/2A engines. With the exception of my old .049 Herkimer Cub (remember, no comments!), I could never get them to run worth a damn—not so, the little Cox. I was absolutely amazed when it fired up on the fourth blade at exactly 2 1/2 turns as promised in the instructions. Before heading to the field, I ran four or five tanks of

E-Z BEE

(Continued from page 34)

EXCEPT FOR A SMALL Phillips screwdriver, the Cox EZ-Bee box contains everything needed to put this little hummer together. It even has the mustard-packed epoxy. For the most part, it's foolproof. (Which we proved!) The only real construction involved is joining the two wing halves and mounting the tail surfaces. It actually takes longer to put the Mylar stickers on than it does to do anything else.

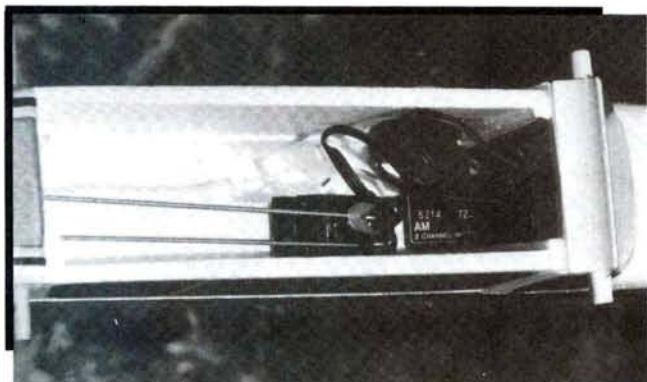
Basically, the Bee is a fuselage-shaped block of expanded polystyrene with snug-fitting pockets for the servos, receiver and battery pack. As the complete kit comes, everything except the second servo (not included) is already in place.

On our airplane, the tail was epoxied into place, and we didn't think there was enough emphasis on getting the stabilizer parallel with the wing. There is a nice little right-angle jig for truing the vertical to the horizontal, but no mention is made of having them square to the wing/fuselage. Current production kits remedy that by making the empennage a bolt-together unit.

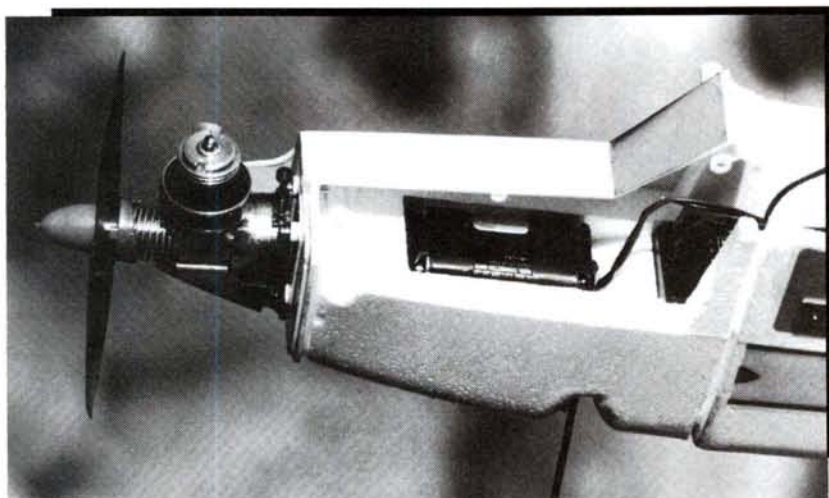
In general, the photos in the manual are a little on the gray side and make it difficult to see a few details, so I put the elevator horn on upside-down. According to the instruction, the "...wings are held together with heavy-duty transparent tape...." Epoxy is given as an option, and we obviously used it. However, we found that some flash had to be cut off the wing roots to get a square, even surface for gluing.

To mix the rudder with the elevator, a small polypropylene fitting screws into the middle of the rudder servo wheel. It's an inspired idea, but it's hard to see how it goes together in the photos.

Total construction time was two hours, 23 minutes, including making a glass of iced tea and prolonged arguments with my 12-year-old about what the instructions *actually* meant! ■



Molded foam and fuselage has provision for servos. One used initially with "auto-elevator" device. Second servo can be added later for independent elevator control. Servos must be securely mounted; see text.



Front end of fuselage with left half of cowl removed to show AA pack located in molded receptacle. Tried and true Cox .049 with spring starter powers EZ-Bee.

gas through it and, each time, it started without hesitation. More important, later in this escapade, I excavated it from the turf, knocked off the bigger clods and it sang its song on the first blade. OK, I'm impressed.

Flight One

The Bee isn't meant to be an ROG model, and the instructions go into some detail on the proper method of hand-launching: "...release the model when the arm is at 45 degrees..." My 12-year-old, Jennifer, tried the first launch, but let go at 43 degrees and launched the Bee into the ground. Lots of laughing. No damage.

Having cranked the little mite up, I ran a few steps, dialed-in 45 degrees and let go. This fugitive from a soda cooler trundled away from me so slowly that I had plenty of time to change hands with the control box, as the plane wobbled its way to altitude.

Tentatively, I tried a little left stick; just as tentatively, the airplane wallowed into a semblance of a left turn. By this time, it had started a series of long swoops into a stall, pitching gently downward and rolling slightly right. It had also wandered out over the side road and I had to turn it around.

Reasoning that if I tried to turn it while it was pitching up, the automatic up-elevator would make the situation worse, I tried it a few times, and it *did* get worse—fast! So I waited until it was pitching down and accelerating before bending it around with periodic jabs of side stick. I had to jab at it, since holding it on one side or the other seemed to cause more pitching than turning.

As it came towards me, I chanted,

"Stick to the down wing, stick to the down..." The chant worked, but mainly because the airplane did everything so slowly and the controls were so limited that I had plenty of time to think myself into the cockpit and avoid scrambling the control inputs. Between pitching and wobbling, Jennifer, the Bee and I made several circuits of the soccer field before the engine mercifully quit. The first sound made in the silence that followed was me saying, "Thank God!"

As soon as the engine quit, the pitching stopped and the machine (if such a sparse collection of parts can be called that) seemed perfectly willing to glide straight ahead, if left alone. While it was gliding, I could see how the elevators seemed to have more effect than the rudder. Still, I was able to get the bird turned around and headed back into the field for a landing that can only be described as beautiful, considering I wasn't touching a single thing.

Flight Two

My second attempt nearly duplicated my first experience, but the pitching became more pronounced and I learned to recover from incipient spirals (not spins) that started at the top of each pitch oscillation. Also, it took nearly full rudder to keep it from turning; until the engine quit, I felt I had only marginal control.

Flights Three and Four

Following the instructions, I made what should have been corrective changes with the rudder and elevator clevis. On launch, the airplane refused to climb and wallowed around in an uncontrollable right

(Continued on page 92)

Monokote®
Now 5 Great
Videos!

Learn from the pros at Top Flite! Step-by-step **MONOKOTE®** application details in clear, easy-to-follow, full-color close up action! Wings. Fuselage. Trims. Color-on-color. Designs. Hinging. Basic through advanced heat gun and iron usage techniques.

(Each tape approximately 1 hour).

"MONOKOTE® I"

Basics on Wings, Tail Sections, Fuselages, Hinging, Color Schemes and Trimming.

"MONOKOTE® II"

Advanced Color Schemes, Designs, Wing Tips, Multi-Color Combos, and MORE!

"MONOKOTE® III"

Airframe Prep, Advanced Wing Tips, More on Hinging, Color-on-Color, Graphics, Painting, and MORE!

"MONOKOTE® IV"

More on Wing Tips, Canopy Covering, Advanced Graphics, Striping, Car Bodies, and MORE!

"MONOKOTE® V"

Detailing Chrome, Scale Tips, Concave Surfaces, Fragile Wing Tips, and MORE!

A COMPLETE
MULTI-TAPE COURSE
FROM THE MAKERS
OF MONOKOTE®

GREAT FOR CLUB MEETINGS!

RENT OR BUY!
\$39.95 each

(\$20 Refund per tape on Rentals, if returned undamaged within 30 days.) Please specify I, II, III, IV, or V with order.

SPECIAL PURCHASE - ONLY COMBO OFFER

Combination 2-hour long tapes
(Specify I & II or III & IV)
Only \$65 each! Save \$14.90!
(Sorry, no rentals available
on Combo tapes)

Send check or M.O. with Name, Full Address and choice of VHS or BETA format to:



TOP FLITE MODELS, INC.
Monokote Video Course
2635 S. Wabash Ave.
Chicago, IL 60616

Small Steps

by RANDY RANDOLPH

IN PREVIOUS installments of this column, Randy Randolph and I have discussed the many advantages of small R/C model airplanes. Ben Underwood of Williamsburg, VA, was impressed by what we've had to say; now he wants to design an R/C aircraft of his own. Never having done this before, Ben wrote to ask how he should start.

Ben's question brought to mind another big advantage of small model airplanes: it's far easier to design them and to draw their construction plans than it is for a quarter-scale project. I didn't mention that in my reply to Ben, but I did give him this advice:

Aircraft design, both full-scale and miniature, is as much an art as it is a science. When working out the proportions of a new airplane, many (maybe even *most*) designers employ the TLAR technique (That Looks About Right). It usually works out quite well, though the designer may not be able to explain precisely why. However, there *are* some fundamental principles and procedures for sport-type R/C model airplane design that anyone can follow, and by following these, you're sure to end up with a fine-performing aircraft.

First, decide on an engine size for your model; this will determine how big the airplane must be. Keep in mind that the smaller the motor, the lighter the model must be in proportion to its wing area. (I've explained this in an earlier column about volumetric loading.) Here's a table of engine sizes and the corresponding wing areas:

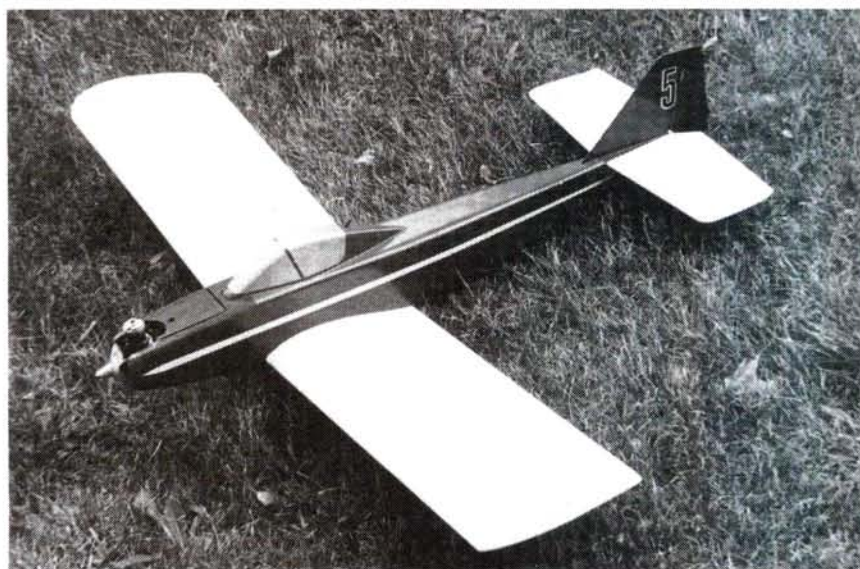
Engine Size (cubic inches)	Wing Area (square inches)
.020 - .030	125 - 175
.049 - .061	200 - 350
.099 - .120	275 - 450
.120 - .150	350 - 500
.150 - .200	425 - 650

The smaller its wing, the faster the model will go; the less weight each square inch of its wing has to carry, the slower the

model will be able to fly without stalling. (Top speed is not affected.) The figures given above are merely guidelines, of course. A Cox* reed-valve .049 engine swinging a 7-3 propeller is easily capable of hauling aloft a 33-ounce, 660-square-inch "powered glider" such as Goldberg's* "Gentle Lady," while .20-powered semi-aerobatic R/C models smaller than 300 square inches have been flown successfully by pilots with no more than average skills. As a rule, however, airplanes with wing areas within the tabulated limits can glide in gently for dead-stick landings, yet they're speedy enough to fly in winds up to 15mph or so.



Dick Huang (from Fort Worth, TX) shows off his miniaturized Old-Timer R/C model: a scaled-down Cleveland "Cabin Playboy." Its proportions are ideal for schoolyard flying.



Ralph Pearson's 34-inch Zippin is a fine example of small R/C model design. Its 7-degree-dihedral low wing makes it stable enough to fly "hands off."

The span of the model's wing should measure from five to nine times its width (called "chord"). A stubby, wide-chord wing is more suited to fast, aerobatic aircraft, while long-span, narrow-chord types work better on gliders.

For a sport-flying R/C model, the wing airfoil should be reasonably thick (from 12 to 15 percent of the chord), with a flat bottom and a rounded front or "leading edge." (The Clark Y airfoil is ideal.) In a

side view, the model's wing should be mounted with its lower surface tipped slightly upward in front—between 0 and 2½ degrees.

As seen from the front, the upward bend of the wing (dihedral) should be 7 degrees per side for R/C models without ailerons, and approximately 3 degrees for those with ailerons. (When designing your first R/C model, making it without ailerons produces a plane that's lighter,

simpler and less likely to go wrong.)

The total area of the horizontal tail (stabilizer and elevators) should be about $\frac{1}{5}$ to $\frac{1}{4}$ of the wing area. Smaller models need larger tails in proportion to their wings. The elevator area may be from $\frac{1}{8}$ to $\frac{1}{3}$ of the total horizontal tail area. For the vertical tail, use slightly less than half the horizontal tail area, the rudder accounting for approximately $\frac{1}{3}$ of this.

The outline shape of the wing and tail components can be pretty much anything that pleases your eye. Just don't make them too narrow or too thin, because they'll flex or flutter in flight and disrupt the control response.

Now for the fuselage design! The nose length ahead of the wing's leading edge should be roughly equal to the wing chord, while the distance between the wing trailing edge and the front of the stabilizer should be approximately twice the wing chord. Although models that are well outside these parameters can fly very successfully, an excessively long nose makes for sluggish response to elevator control, while too short a tail can result in a skittish, inconsistent airplane performance. On the other hand, an unusually long tail may make balancing difficult. Nose ballast can be added easily enough, of course, but extra dead weight is detrimental to small R/C aircraft.

The airplane's CG, or center of gravity (the point at which it balances) is critical to its success in flight. An R/C model of conventional configuration *must* balance no further aft than $\frac{1}{3}$ of its wing chord behind the leading edge. It's far better to fly a nose-heavy airplane—even one that's *quite* nose-heavy—than one that's just a tiny bit tail-heavy. Tail-heavy airplanes respond erratically to their controls; they'll stall, snap-roll and spin with very little provocation.

If you're designing a conventional model with a nose-mounted engine, you can get by with the thrust line aimed straight ahead. However, on my small, sport-type R/C airplanes, I always tilt the thrust lines down and to the right a few degrees, so my models respond to the controls in the same way, whether or not the motor is running. Under power, most R/C models have a tendency to turn left and nose up: Angling the thrust line to compensate for this is easily done, so the



Another shot of "Zippin" reveals its ideally positioned landing gear. The wide tread and location just ahead of the model's CG ensure good takeoffs and landings.



A good example of "TLAR" model design technique, Ralph Pearson's 24-inch, .020-powered Duperbipe is a bit on the unconventional side, but flies great.

model flies straight with the transmitter stick in neutral, whether or not the engine is running.

Your personal preference can determine the fuselage's size and shape. It must obviously be big enough to hold the engine, tank and radio system, but other than that, your imagination can be given free reign. It's nice to have plenty of space available inside an R/C fuselage so that installation of the vital components isn't like assembling a ship in a bottle. Still, the fuselage shouldn't be *too* huge!

To gain access to the radio gear of small R/C models without providing removable hatches, I have a useful strategy. The engine-R/C system installation I used in my $\frac{1}{2}$ A Osprey biplane was featured in the March '88 issue of *MAN*. The Osprey's motor, tank and all R/C items are mounted on a plywood rack, which can slide out of the nose of the model when four screws are removed from the fire wall. This method can solve a lot of tricky design problems, especially in a biplane!

For the landing gear, I like the two-wheel type better than the tricycle, but whichever you prefer, your model will be fine if you locate the wheels properly. For best takeoff and landing performance, the axles of a two-wheel gear should be approximately in line with the leading

edge of the wing. A trike gear setup shouldn't have its main axles too far aft: The nose wheel needs to carry just enough load for reliable steering, and no more. Too much weight on the nose wheel makes for difficult takeoffs and bent nose-gear struts! Locate the main wheels so the front edge of their tires is just aft of the CG.

For control pushrods in the small R/C models I design, I always use Su-Pr-Line's* Nyrods. They're lightweight, have very low friction, and don't yield sideways under load as wire or balsa-stick pushrods all too often do.

When finishing my own small R/C models, I usually use "traditional" doped silk and tissue coverings. I prefer them because most iron-ons are too heavy, and some soften a lot in hot weather. However, if you choose to use iron-ons, I recommend Coverite's* Micafilm. It takes slightly more skill to use than Goldberg's Colortex, but it's far lighter, stronger and more fuel resistant. As Randy was kind enough to show me, the main trick in applying Micafilm is *not* to shrink it with a heat gun: Just use the iron for that. While shrinking, be sure to keep the iron away from the sealed-down edges, because the melting point of Balsarite (the adhesive used for attaching Micafilm to the model's structure) is very close to the shrink temperature.

One other thing I like about Micafilm is that it can be painted with just about anything if it's installed shiny-side down. That allows me to use painted-on trim, doped-on decorations of colored tissue, or to finish the entire model in any color I choose, rather than being limited to the stock colors.

All these suggestions are, of course, merely guidelines. If you're designing a small-scale R/C airplane, you're limited only by your imagination. Until next time, remember that good things come in small packages.

**Here are the addresses of the manufacturers mentioned in this article:*

Cox Hobbies, 1525 East Warner Ave., Santa Ana, CA 92705.

Carl Goldberg Models, 4734 West Chicago Ave., Chicago, IL 60651.

Su-Pr-Line Products, 18800 State Rte. 47E, Sidney, OH 45365.

Coverite, 420 Babylon Rd., Horsham, PA 19044. ■



Jet Blast

by RICH URAVITCH



Butch Sichel's giant Concorde has flown... briefly. This photo was taken at Seguin, TX, four years ago! Hope he eventually rebuilds it.

WARNING!
DUCTED-FAN AIRCRAFT
NOT PERMITTED AT THIS
FLYING SITE!

THAT, FELLOW FAN fliers, is a sobering, and not totally unrealistic thought. I've just returned from the great state of Texas and the 6th Annual Greater Southwest Fan Fly, coverage of which I'll be bringing you in our February '89 "Jet Special" issue. I had a long talk with Dave Tyson*, who handed me a brochure with the above headline on the cover sheet. Dave has recognized some of the problems that we fan fans have encountered and has anticipated some which will surely surface. He's setting out to form a new, nationwide

organization called "JPO" or Jet Pilot's Organization.

Before you groan and say, "Another



Bob Kress shows off his prototype baby Eagle (Eaglet?). Balsa and foam cutie will take a single RK-709.

special-interest group??" let's recognize that there's virtually no other way to get the unique requirements of the ducted-fan enthusiast recognized by the policy-

making aeromodeling organizations that govern our activities. If there's no voice to inform the policy makers, they're forced to make uninformed, sometimes unrealistic, decisions. It's not their fault; they simply may not *know* all the implications. In addition to providing representation, JPO will have all the usual trappings of any other similar organization; contest guidelines, newsletters, hats, patches. It sounds like a good idea to me, and if you'd like more detailed information, contact Dave at the address provided at the end of the article.

Eagle Keepers

Bob Kress—father of the "RK" series of fan units and owner of Kress Jets, Inc.*—was on hand at the SWFF also, answering lots of questions and showing a prototype of a small, single-engine F-15 Eagle that

FLASH

Bob Fiorenze wins Scale Masters '88 with F/A-18 Hornet!
(Full report next issue!)



Bob Violett Models' new Aggressor II has blistering speed; demonstrates that fine-tuning a design can improve performance.

he plans to produce. The construction is balsa sheet over foam with some of the more "swoopy" lines created by vacuum-formed plastic parts. Bob is apparently focusing his efforts on the smaller sizes of fans, figuring that they're more within the reach of the average modeler than the larger, and more expensive, units. I'm not sure about that, but it's nice to see something being done in this area. The mini-Eagle will utilize his new RK-709 fan unit for propulsion, and this has a 3.3-inch diameter and is 4.5 inches long. The intended engine is the Cox* TD .09, but computer-derived performance data indicate a thrust potential of 2 pounds, using a higher-performance powerplant like the Enya* .11CX—not bad, for a small package. Bob also provided a couple of photos of a larger, scratch-built F-15 done by Bo Clinton of Oak Hill, FL. The Eagle is powered by a pair of Bob's RK-720 fan units. With an all-up weight of 5½ pounds, the thrust seems to exceed the weight, and this should provide some outstanding performance. Hope to have a flight-report follow-up.

Hanger Talk

Larry Wolfe, president of Jet Hangar Hobbies*, has been at this ducted-fan stuff for more years than most people, and he sent us a letter that picks up on the discussion we started back in the September '88 issue regarding the failure of some of the O.S.* .77 fan engines after a short period of operation. Larry reports that his experience has shown that failures of the type described (rod) have occurred regardless of the type of fuel being used, and this may indicate an inherent weakness in the engine. He has provided some interesting information, which we'll try to double-check before presenting it to you. Anyone else care to relay their experiences? Part of his letter gave a handy tip, which we present for your consideration: "It's wise to break the engine in on inexpensive glow plugs. Since the weakest link is the glow plug, we advocate the



Very pretty F-15 from Florida. Uses two Kress RK-720s for power. Thrust-to-weight better than 1:1!

use of an inexpensive plug until there are no failures. Use of a higher-quality glow plug with a thicker filament isn't recommended initially, because the engine may be damaged if the filament becomes trapped between the piston and sleeve. Our F-4 Phantom flies between 140mph

and 160mph with a modest setting on the O.S. .65 and Turbax III combination." Thanks for the tip, Larry.

Quickies

- Canadian scale wizard and old buddy, Gerry Fingler, has gotten into the fan foray, and, as could be expected, has produced a jet model as well-executed as his highly competitive L-19 Bird Dog. This time, it's a Canadair Tutor finished in the livery of the Canadian Forces aerobatic team, the Snowbirds. As you can see from the photo, the model is scale, right down to the smoke tank and operating speed brakes. How about some flight shots, Gerry?

- Bob Violett Models'* new Aggressor II is a refined version of the original Aggressor and features a smaller, foam-core wing like the BVM Viper. The built-up balsa wing of the original is history; I've seen the new one fly, and it's a rocket ship. Claimed to be faster than even the 180mph Viper, comparison becomes academic beyond that number. The real accomplishment is the degree of detailed engineering and execution that allow

(Continued on page 110)



Canadian scale competitor Gerry Fingler with his scratch-built Canadair Tutor—Gerry's first ducted-fan project!

M I D W E S T AEROSTAR 20



Photos by Rich Uravitch



Two newcomers build and successfully fly this bird with no major problems.

by GEORGE & WILMA NAIL

SPECIFICATIONS

Type: Built-up basic flight trainer
Wingspan: 52½ inches
Weight: 3½ to 4 pounds
Wing Area: 472 square inches
Power Req: .20 to .25, 2-stroke
No. of Channels Req: 3 (min.)
Suggested Retail Price: \$59.95
Features: "Success Series" instruction book, built-up lite ply and balsa construction, stylish appearance.

WE CAME FROM TEXAS to Long Island to visit our daughter, Maribet, and our son-in-law, MAN Editor Richard Uravitch, intending to stay a couple of weeks and to enjoy just being together. One evening, Richard brought out a big box and said, "Build." That's how it all started.

This big box contained all the makings for an Aero-Star .20 from Midwest Products*. Little bits of wood, bigger pieces of wood, tubes, rods, screws and 104 pages of instructions to tell you how to put them all together. Never having done this before, I laid everything on the table and just looked at it for a couple of hours, wondering if I'd ever see a completed airplane. (I knew it should be an airplane, because of the picture on the outside of the box.)

ASSEMBLY: I finally took the bull by the horns and started. Beginning at Step No. 1 and continuing through No. 25 (fewer than 10 percent of the total steps), I had no problems. Following the instructions and the drawings, I soon had a completed stabilizer and an elevator (whatever they are!). They looked great! (I think!)

Then I started on the fuselage, and was soon going great guns. The drawings

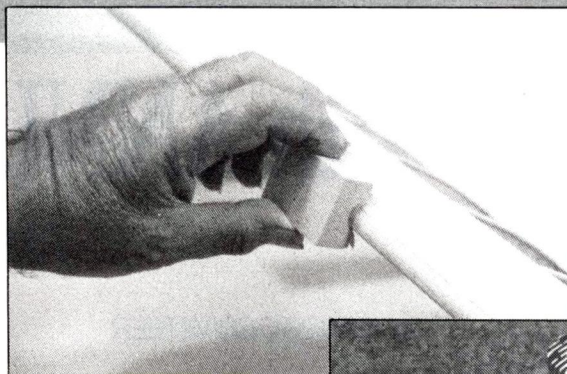
and the instructions were very clear, and the pre-cut pieces fit very well; a little sanding was all that was necessary. To fill the little gaps between pieces, the instructions suggested a mixture of baking soda and CA (you see, I learned the right terminology quickly!) and I soon had a good strong joint with no gaps. As was suggested, at Step No. 68, I realigned the tailpost with the fuselage sides. When it looked as though it was in the correct position, I ran CA down the inside of the joint, but it didn't seem to be sticking, so I put in a little more and then discovered that it was running through the tailpost and dripping onto Wilma's pants leg! I was delayed while cutting the pants leg off Wilma. Of course, I cut off the other pants leg too, and she was more comfortable in shorts, anyway.

When I'd completed the front end, installing the motor mount and the fire wall, Rich suggested that we fuelproof the engine compartment with epoxy resin. In doing this, I found it necessary to put all the engine-mount and nose-wheel-mount screws in their proper holes, with plenty of oil on them, so they could be removed after the epoxy had cured, for later installation.

The wings went together smoothly; laid out on the plans, everything fit as it should. I had a little problem with the wing tips, because I didn't know exactly what the angles of the tips should be, but after re-reading the instructions and studying the drawings, I was able to complete these parts. When I glued the two halves of the wing together, the dihedral (now, I'm *really* impressing you!) worked out exactly as the instructions said it would.

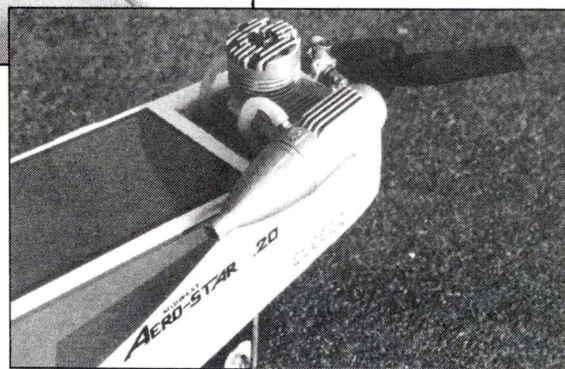
When preparing to fit the wing to the fuselage, I was temporarily installing the dowels in the fuselage and discovered that I hadn't put parts No. 5 and No. 6 where they should have been. These were two little bitty pieces called reinforcing blocks, which support the dowels for the wing. So I learned a lesson the hard way, i.e., check and re-check every step. I'd skipped Steps 35 through 38, and it was very difficult to go back to install such little pieces in an almost inaccessible spot. At this point, I turned the construction over to Wilma, who, with her little bitty hands, put those blankety-blank pieces in place. It's surprising that Wilma's fingers aren't flying with that airplane a couple of hundred feet over Long Island; that CA really sticks things together!

(Continued on page 116)



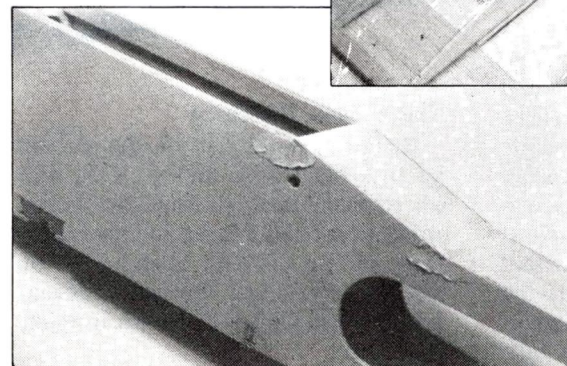
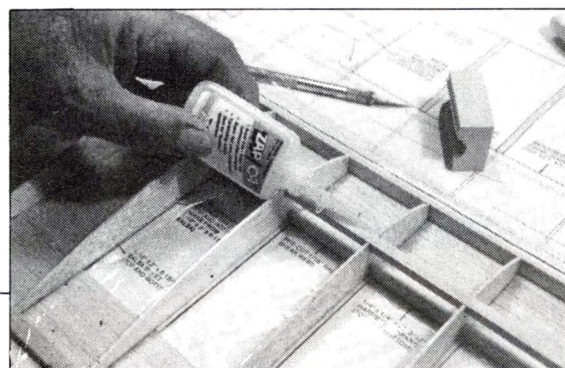
Kit includes sanding block that facilitates accurate shaping of wing leading edge. All-balsa and light-ply construction is conventional and teaches good technique.

O.S. .25 FSR with muffler is a great choice for the Aero-star. Kit-supplied Mylar decals add a nice, scale-like touch.



Both wing panels under construction. Clear plastic food wrap used to protect plans during building. Better than waxed paper, CA doesn't stick to it.

Wing goes together easily following excellent instruction book; quickly as a result of using CA. (ZAP shown here.)



Magic Model Filler was used to fill small depressions where light-ply bulkheads were joined to fuselage sides. Sanded smooth prior to covering.



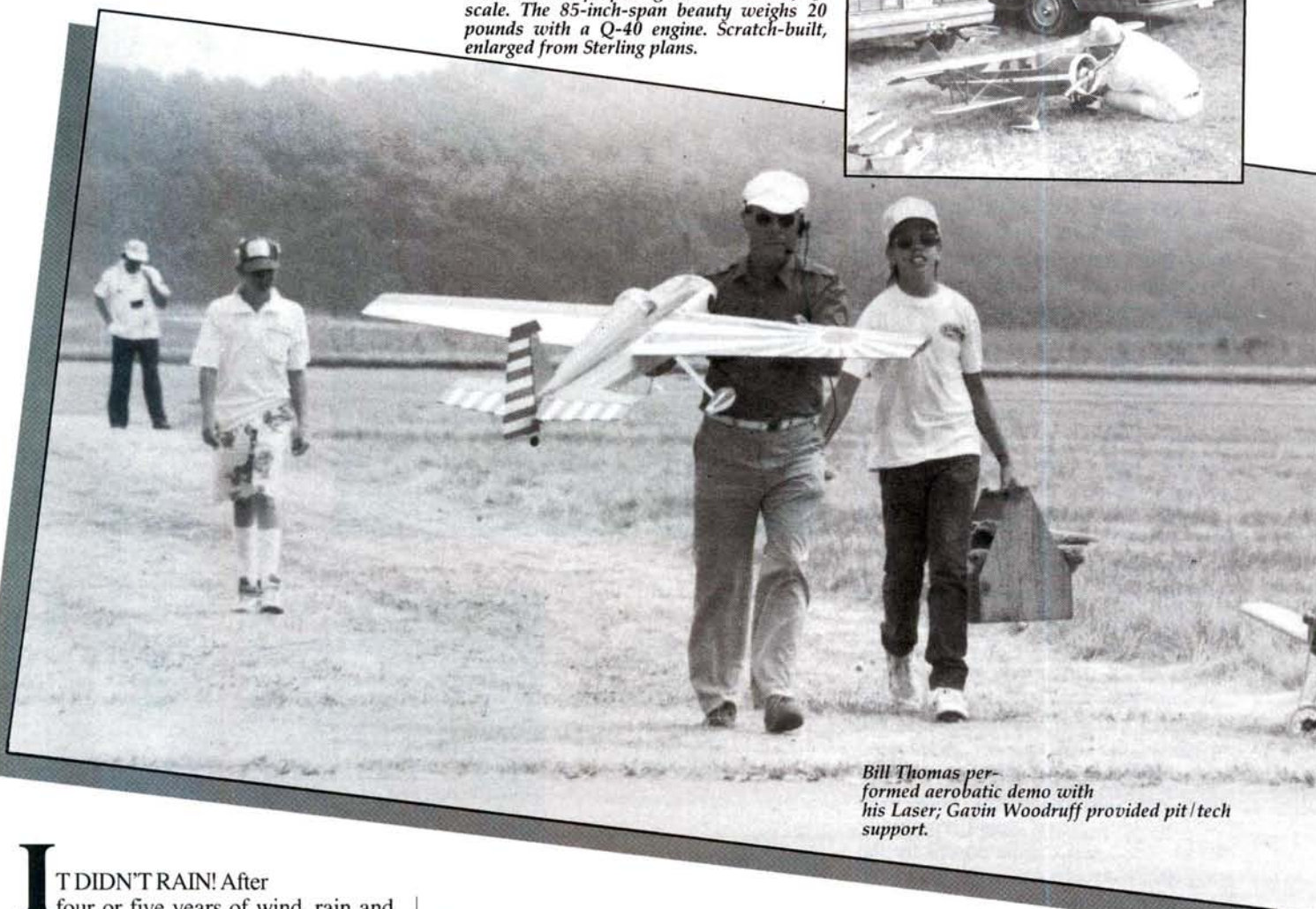
Bob Dunn's McDonnell Doodlebug is an unusual scale subject. 105-inch span, 18 pounds, Q-35-powered. Note size of flaps!!

11th ANNUAL S.T.A.R.S.

11th Annual Edition of a

by GEORGE PRIVATEER

Milt Greene is preparing his "E" WACO, 1/5-scale. The 85-inch-span beauty weighs 20 pounds with a Q-40 engine. Scratch-built, enlarged from Sterling plans.



Bill Thomas performed aerobatic demo with his Laser; Gavin Woodruff provided pit/tech support.

Photos by Lou Eltscher.

IT DIDN'T RAIN! After four or five years of wind, rain and cold knocking out competition on at least one of the two days of previous Scale Rallies, our 11th Annual was, at last, a full two-day event. This year's weather was hot and humid; not quite as unbearable as rainy and cold, but sticky and unpleasant at times. This year, as well as having medical emergency personnel and equipment on hand, we also had to take precautions against heat prostration.

(There was one case.)

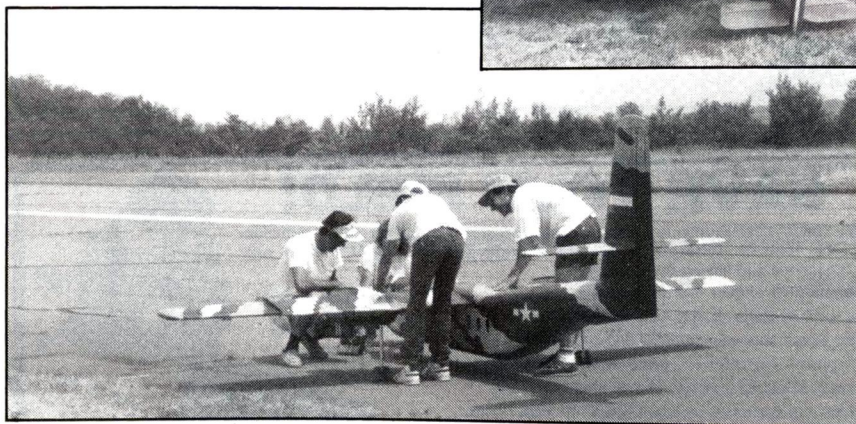
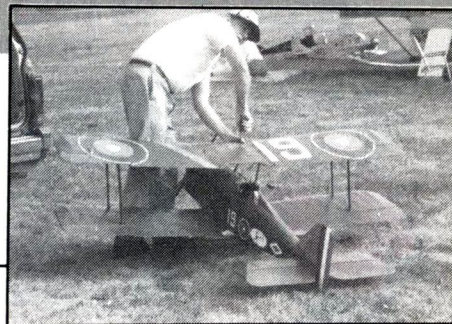
By late Friday afternoon, the parking lot was filled with trailers, RVs, fifth wheelers and tents. As usual, the first to arrive were Rudy Meyer and his entourage of the Flying Dutchmen of Kitchener-Waterloo, Ontario, Canada, and, as usual, Rudy was the first to fly on both days.

Eighty-four ships were registered, and

more than 30 clubs were represented. Most of the fliers came from within 150 miles, and there was a large contingent from Canada. The fliers who travelled farthest were Stan Dzon from St. Claire Shores, MI, John Pagan from Beaumont,

SCALE RALLY

Classic Scale Meet



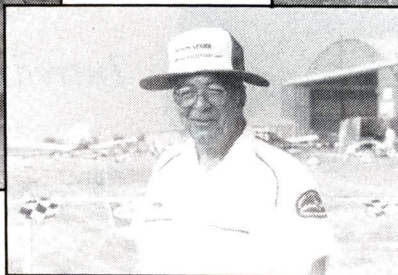
Top Right: Bob Dunn, STARS, 1/4-scale scratch-built SE-5a Quadra.
Above: Stan Dzon's mammoth 17 1/2-foot-span DeHavilland DH-4 Caribou; 54 pounds with dual Sachs 3.1 engines. Minor problems prevented flight.



Stampe biplane, built and flown by Alan Horner from Ontario, undergoes safety check. ST3000, 82-inch span, 17 pounds.



Curtiss Racer on safety-check table. Scratch-built, 1/4-scale, 85-inch-span, 24 1/2 pounds with Q-40 engine. Pilot unknown.



Neat, double-visored hat of El Presidente George Privateer says "I'm their Leader; which way did they go?"

TX, and Dan Heistand from St. Petersburg, FL.

For the most part, flying was consistently good in spite of a rather bad crosswind. Stan Dzon's two magnificent ships were the highlights of this year's rally. One was a 12-foot, 8-inch-wing-span Lockheed Hudson bomber powered by two Zenoah 2.38 c.i. engines. It flew very well and realistically. Unfortunately,

he didn't have a chance to fly his other ship, which was a 17 1/2-foot, 54-pound, DH-4 Caribou powered by two Sachs 3.1 c.i. engines. It has a cargo door that can release up to eight parachutists, as well as custom-made electric retracts, engine synchronizer, flaps and lights. This ship didn't fly because, when starting its take-off run, all six tires blew because of the intense heat.

John Pagan* flew his Christen Eagle and a 1929 Fleet Biplane. With his well-equipped RV, John travels all over the country to teach R/C flying with his six-hour program. The first two hours involve training on a computer-developed program, and the remaining four hours are spent in intensive flying—and it is intensive. The only time the ship comes down

(Continued on page 124)

ZAP UNIVERSITY

COLLEGE OF GLUE KNOWLEDGE



Prof. Sticky VonShtuck

After Run

All pros use After Run after a day's flying. Stops corrosion from forming on the engine bearings. Restores continuity in electrical components. Excellent cleaner or lubricant. Stops control cables from developing rust inside the sleeves. Want your engine to last longer? Use After Run.



Pacer Tech, Campbell CA

SAVE YOUR FIELD!

The "SNUF-LER" muffler is a low cost, easy to install, lightweight, sound reducing muffler with no performance penalty. It is the answer to AMA muffler rule suggestions and saving flying fields.

- Meets AMA muffler rule suggestions.
- 3 to 10 decibels quieter than stock muffler.
- No power loss with possible 300-500 RPM increase.
- Improves engine idle — gives better fuel economy.
- Easily attached to most .25-1.08 stock mufflers.
- Heat and corrosion resistant Black "E" coat finish.
- No special adapters required.
- Weighs 3.5 ozs.

Fits: ASP, BRAT, ENYA, FOX, HP, IRVINE, K & B, O.S. MAX, ROYAL, YS and SUPER TIGRE mufflers.

If not available at your hobby shop, ORDER DIRECT for immediate shipment. Check, M.O., Visa, M.C., or C.O.D. accepted. Add \$2.50 for UPS, \$2.00 for C.O.D. and 6% sales tax - for Calif. resident.

SEND 25c or STAMP FOR ADDITIONAL INFO AND JTEC CATALOG

"SNUF-LER" MUFFLER

Pat. Pending



\$24.95
CAT. NO. 800

JTEC
164 School St., Daly City, CA 94014
(415) 756-9734

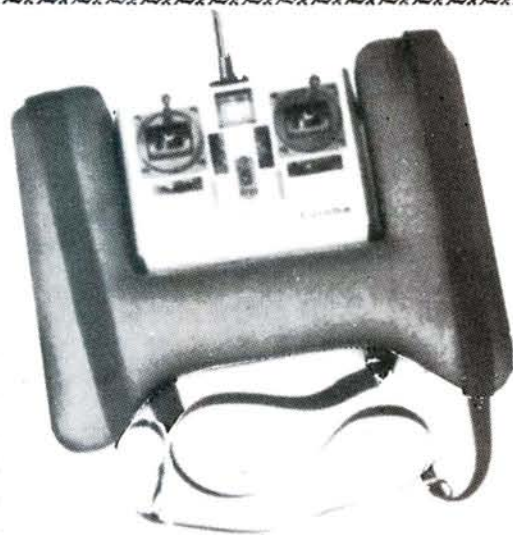
SENIORITA

(Continued from page 16)

COVERING: The instruction manual discusses in some detail the procedure for covering the Seniorita with silk and dope. Unfortunately, this method is a lost art; I unsuccessfully attempted it in my early modeling days. Consequently, I prefer to use a more modern finishing method, so I covered the model with Transparent Red MonoKote from Top Flite*. After all my work, I just couldn't hide the wooden structure. For trim, I used Goldberg's* Yellow Ultracote. I'd never used Ultracote before, and I was pleasantly surprised to discover that instead of the familiar, clear, plastic backing, Ultracote has a paper backing like that on peel-and-stick decals. I was thus able to draw the pattern/design of the trim onto the backing and then accurately cut perfectly symmetrical patterns to match the left and right sides.

The design parameters for the Seniorita call for a .15- to .25-size engine, and I decided to use an Old Thunder Tiger .25 engine. Although it runs very well, this engine has had a long life. I acquired it several years ago after it had been used by at least two other owners. Needless to say,

(Continued on page 82)



\$52⁹⁵

With set of Gimbal Extenders

\$3.50 Postage & Handling

**B & J
ENTERPRISES**

1100 Center Street Havre, Montana 59501

B & J Enterprises

is proud to introduce to you,
one of the latest ideas in radio controlled flying.



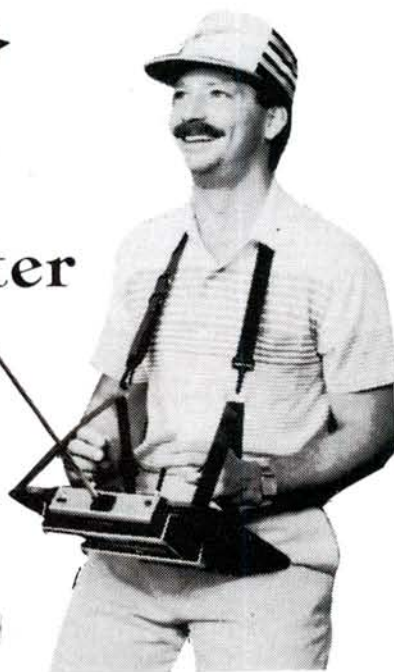
Introducing:

The XT-1 Transmitter Tray

The XT-1 Flight Tray was specially designed to improve the flight performance of both the novice flyers and the experienced top competitors. It's sleek new design is light weight and is padded with an elegant vinyl upholstery cover, making it both comfortable and attractive to wear. The XT-1 Flight Tray has an adjustable neck strap and is easy to adjust to any size.



TO ORDER:
CALL:
1(406)265-4828



"We Make Flying a Breeze"

Construction

CLASSIC SERIES!
GREAT BEGINNING

Twilighter

by L.F. RANDOLPH

TWILIGHTER started life as a hand-launched sailplane and was successful to the extent possible with a somewhat aged and overworked arm. When the fact that I was not what I used to be was faced, I built a new fuselage to accommodate an .049 engine. With the new power source and some tinkering, the airplane became what was hoped for initially, a quiet easy-flying machine for leisure hours at the local school yard.

The tinkering consisted of adding a muffler, three head gaskets and an 8x4 prop to the engine. With this arrangement the airplane is almost as quiet as an electric and, if allowed, will climb completely out of sight in the 8 minutes of power provided by the Golden Bee tank.

As for aerobatics, or tricks as my schoolyard friends call it, I'm afraid not! It was designed to climb, cruise around for a while, and glide back in a lazy sort of way. I think it would make an excellent trainer for someone who must learn to fly R/C without the help of an instructor. It is gentle.

CONSTRUCTION. The construction is rather simple and should be completed in a week of evenings even if built at a leisurely pace. The structure is all balsa with the exception of the plywood firewall and dihedral braces and the hardwood dowels that anchor the wing-holding rubber bands. Start the wing by gathering the wood for the ribs, spars, trailing edges, webs, dihedral braces, and wing tips.



Randy's granddaughter, Sheri Smothers, demonstrates the convenience of the Twilighter, both in size and arrangements.

There are several ways to cut out wing ribs from $\frac{1}{16}$ -inch balsa sheet. Making a card-stock template and tracing around it with a fiber-tip pen to produce a "printed sheet" is my favorite, but blanks can be cut from sheet, stacked and pinned together, then the ribs band-sawed all at once. Whichever way you choose, 28 are required. Trim $\frac{1}{16}$ inch from the top and bottom of two of them for the center ribs, which will be covered with $\frac{1}{16}$ -inch sheet, and enlarge the spar notches of four more to receive the plywood dihedral braces. Strip the spars and leading and trailing edges from the appropriate size sheet balsa and cut the dihedral braces from $\frac{1}{16}$ -inch plywood. Make the spar

TRAINER

*Jon Smothers,
Randolph's grandson,
prepares to launch
for an after-school
flying session.*

SPECIFICATIONS

*Type: Basic R/C Trainer
Channels: 2/3
Wingspan: 53 inches
Area: 355 square inches
Weight: 16 ounces
Engine: .049 to .051*

Introduce your son and his friend to R/C with this basic trainer!



webs from vertical grain balsa sheet and the tips from soft $\frac{1}{8}$ -inch wood.

The wing is built in three pieces, a center section and two tip sections. The plan shows the center and one tip section. The second tip is identical to the first and is built over the same plan by reversing sides with the angled rib at the dihedral joint (i.e., on the right

side instead of the left).

Cover the plan with wax paper and pin the main spar and the bottom trailing edge sheet in place over the center section plan. Trim a piece of $\frac{1}{16}$ -inch sheet, $2\frac{1}{4}$ inches wide, to fit between the bottom main spar and the trailing edge, and glue it in place at the center of the wing. Then glue the two center ribs to the spar, the sheet, and the trailing edge. Glue one of the spar webs between them, then add the rest of the webs and ribs. The ribs with the trimmed main spar notches are slanted at the angle shown on each side of the center

section. Add the top main spar and the top leading edge spar and the leading edge. When the glue has set, remove the section from the plan and add the bottom leading edge spar and trim all spars, the leading and trailing edge, flush with the end ribs.

Build both tip sections in the same manner; one left,

TWILIGHTER

one right. The top spars are trimmed at the outboard ends to fit against the $\frac{1}{8}$ -inch sheet tips at the angle shown in the dihedral diagram.

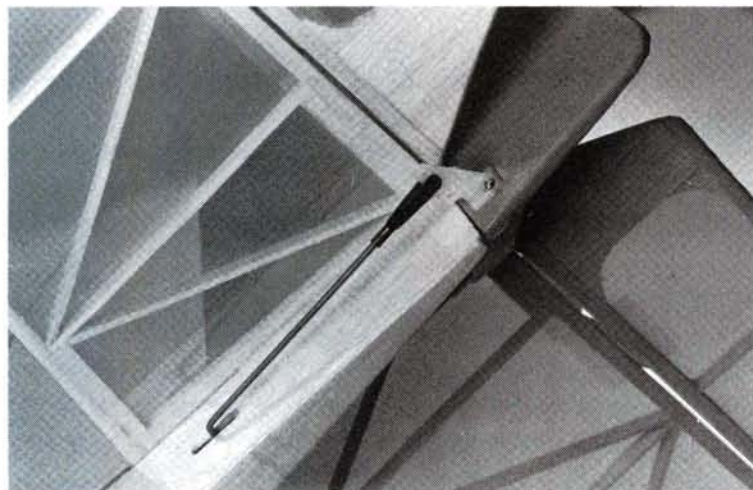
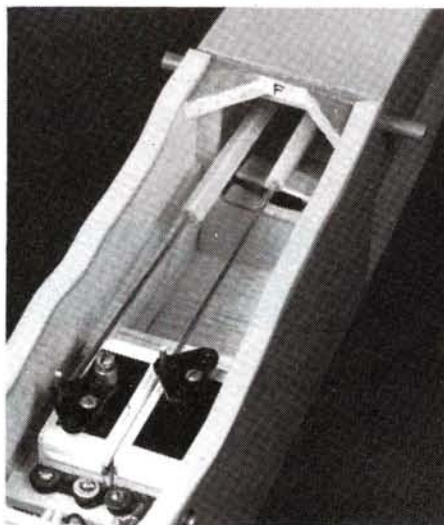
The three sections are joined by pinning the center flat on the bench or board, elevating the tips $4\frac{1}{2}$ inches, and gluing the ply dihedral braces on each side of the main spars where they join. Glue the leading and trailing edges and the faces of the ribs together as well. When both tips are joined to the center and the glue has set, add the top trailing edges, then turn the wing over and add the dihedral braces to the bottom spars. Complete the sheeting of the wing center and sand the complete wing. Before covering, glue a piece of $\frac{1}{16}$ -inch music wire to the trailing edge at the center to keep the wing-holding rubber bands from digging into the wood in this area.

The stab and rudder are both built from $\frac{1}{8} \times \frac{1}{4}$ -inch and $\frac{1}{8}$ -inch-square balsa which can be stripped from sheet wood. The leftover pieces are used as uprights during fuselage construction. Build right over the plans after covering them with wax paper. Build the elevator in one piece, joined by the leading edge spar, and when the $\frac{3}{32}$ -inch music wire carry-through is glued in place, the wood in that area can be trimmed away. The sheet parts of the rudder and stab can be soft wood but the part of the elevator that

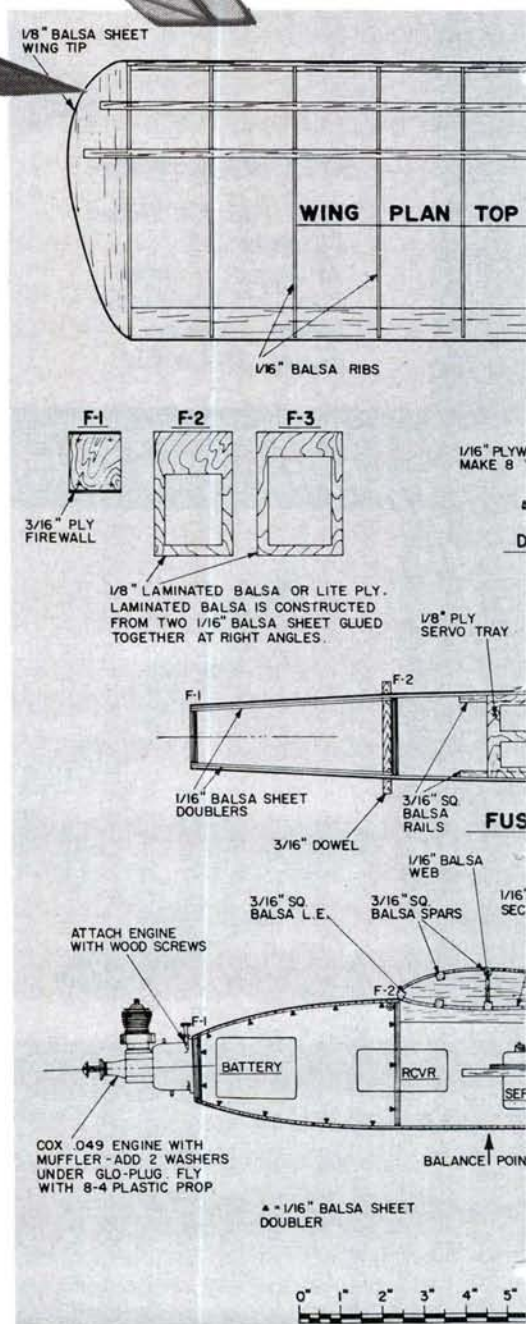
(Continued on page 146)

A quiet, easy-flying machine for leisure hours. It is gentle!

Since the engine has no throttle, two servos do the work. A 500-mA battery and combined radio and airframe weight are still less than a pound.



Stab and elevator assemblies are glued to the fuselage after they are covered. Film must be stripped at glue joints.



An interesting twist on the Buddy-Box approach to flight training

THE SHADOW BOX

by MIKE KORNELY
and KEVIN CASSIDY

“UP, JOE, UP; more up; left; *too much!* Up, up, quick—give me the box! Heard that before? Volumes have been written on how to survive first flights. The reading, dry flying, coaching, observing, and mental prep all suddenly blank out, and when that instant reflex response is required, it's not there. The first time you grab the sticks, you really don't know what to expect!

There are trainer cords and computer-run flight-simulators, but a while ago, Don Dewey approached the problem with a mechanical array of cables and a

plywood board. The thumbs-on-top-of-thumbs method certainly isn't ideal: There's always that problem of people wondering why two guys are standing so close, holding hands in the middle of a field, looking blissfully into the sky!

We needed a way to simulate what stick movement *really feels* like, without entrusting a transmitter to a beginner and endangering a precious plane!

After long discussions and many cups of coffee, the “light went on,” and we devised a system that allows a student to hold a “real” transmitter and to move the sticks while watching an airplane being

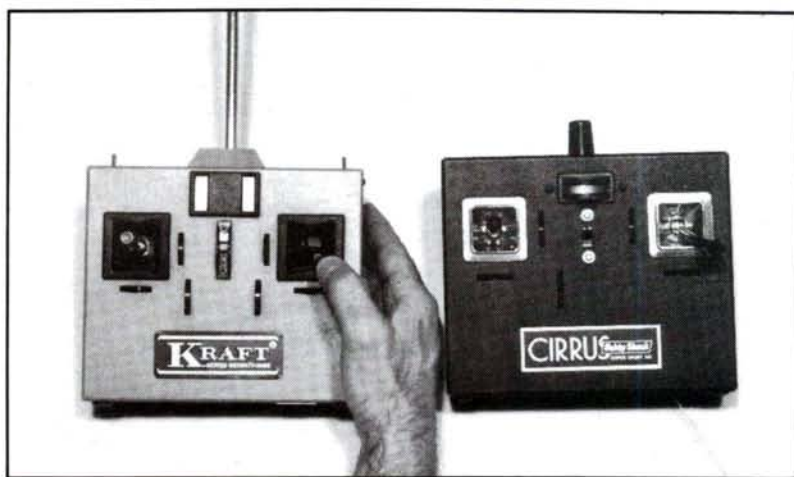


FIG. 1
RIGHT TURN

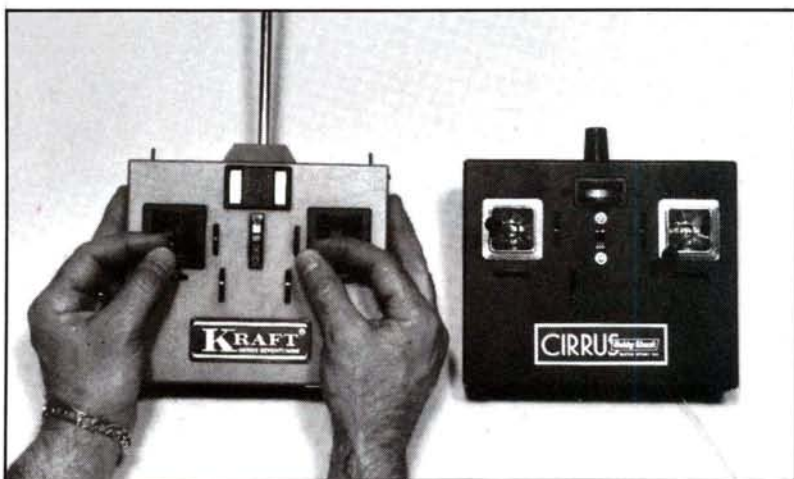
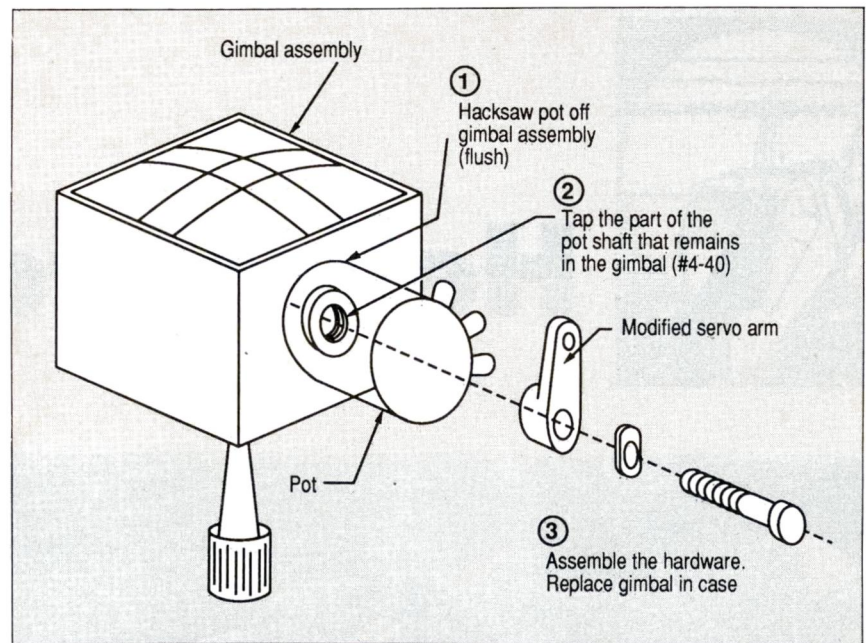


FIG. 2
RIGHT SNAP

flown by the instructor. Conversely, and most important, it allows the instructor to feel the student's stick movements while he watches the plane being flown by the student. Your eyes never have to leave the model—that's the key.

The inspiration for this project came one day at the field when we had two aircraft on the same frequency with both receivers on. As one was being flown, we noticed the surfaces of the one on the ground reacting to the flight commands. By putting our fingers on the surfaces as they moved, and at the same time watching the *other* plane in flight, we could feel the pilot's inputs. We realized that if we could make transmitter *sticks* move to commands, it would be even more instructive than just feeling control-surface movement. We knew we were on the right track, and we set about building a "slave" transmitter. We wanted a receiver and servos mounted inside a transmitter case, with the servos moving the gimbals (sticks) in concert with the active transmitter, and we eventually produced the Shadow Box.

We started by scrounging used equipment. After some calls and plaintive pleas, Tom Hunt dug up a gutted transmitter that still had gimbals. Ron Farkas was reviewing his Aero Star and had an extra receiver on the same frequency, and he lent us this for our project. We had extra servos for the Shadow Box, so that was it! The box went together without too much



trouble, and, as you can see by the pictures, if you pull a command on the transmitter stick, the stick on the Shadow Box moves also.

Now to try it! Ron volunteered for this, and, since he's a very experienced instructor, he was the best person to judge it. (Besides, it's his airplane!)

The first test was with a student who had experienced only a limited amount of glider flying, so the Aero Star would be this fellow's first try with a 4-channel airplane. During the first few minutes, Ron flew the plane, giving a continuous description of his actions, while the student followed along on the Shadow Box. They then switched boxes, and Ron followed along while he coached the student. Things went well on that flight,

but the acid test would have to be with a *brand-new* student. Ron continued to bring the rig to the field, always hoping to meet someone who was there for the *first* time.

Sure enough, one day, a 15-year-old arrived with his first model, and Ron volunteered the Aero Star and Shadow Box to the youngster for his first lesson. The boy was given an orientation/demonstration flight on the Shadow Box before switching to the active transmitter, and then he flew the Aero Star for about 10 minutes. As Ron coached the student and monitored the commands on the Shadow Box, he could tell exactly what the student was doing right or wrong. This test really proved the worth of a tactile training device, and it has never before been available.

Since then, we've made additional demonstration flights, and other instructors have been impressed with the Shadow Box's capabilities. Building a Shadow Box would be a worthwhile project for any club. It could also be used to teach the finer points of aerobatics to more experienced fliers. The instructor could fly a difficult maneuver while the student feels the amount of control input, sequencing, timing, etc., that's required. For a real thrill, just imagine taking your Shadow Box to a pattern meet and tuning in on the likes of Hanno Prettnner! That would be a *real* revelation to budding competition fliers.

It isn't difficult to construct the box. Exact directions depend on the manufacturer's product, so we offer only a general description.

(Continued on page 94)

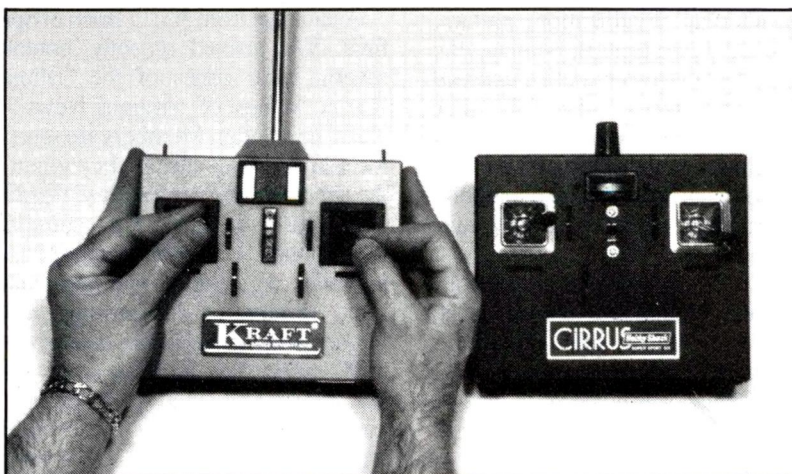
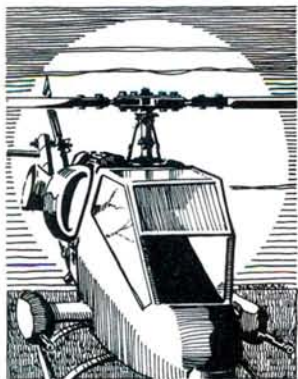


FIG. 3
LEFT SNAP

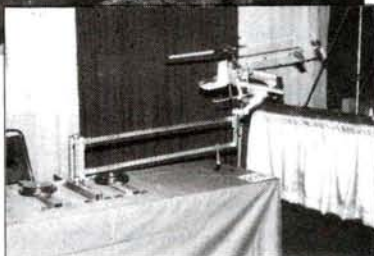


Helicopter Challenge

by CRAIG HATH



Here's a training gear like the one described in the article. They effectively save on wear and tear during the learning process.



Another alternative to the training-gear problem is this stand from Whiteman Industries. This stand won't allow the helicopter to strike the ground in any attitude.

IN THE JUNE '88 issue of *MAN*, I suggested that we need a national organization specifically geared toward R/C helicopter enthusiasts. Our special group needs an organization that will represent us to the government and the Academy of Model Aeronautics. This group could work out the details of national competitions and give all fliers a voice, where, at the moment, they have none, e.g., in the AMA's rule-making process. Very few people are able to affect the rules that regulate organized competitions, and they have very little information from fliers to draw on. Since there are relatively few contests to attend, fliers have little chance to express their views. I live on the West Coast, and during an entire year, I could only find one contest to attend. There are lots of fun flys and get-togethers, but no *real* schedule of contests, and almost every flier I talked to said that he'd like to regularly test his skills against the skills of others. So why don't we get something going? Every other group in the hobby seems to

have a national organization: pattern, pylon racing, scale groups, boating, etc. This year, the AMA even held a *national* fun fly! Who picked the helicopter events? Who has a voice in which maneuvers are flown at the AMA Nationals? Since the popularity of R/C helicopters is growing rapidly, we have a large available power base.

As well as the organization of competitions, we also need to consider insurance coverage at our flying sites. If you're a member of the AMA, your primary intention when joining was probably to receive the liability insurance coverage. However, if you fly from a school yard, a parking lot or any area where you *don't* have the owner's written permission, and have these owners named as "additional

insured" on your AMA policy, your coverage is probably void. This problem has spawned increasing numbers of helicopter-oriented clubs, and it's much easier to achieve a common goal as more people become interested.

Robert Sims of Ann Arbor, MI, responded to my call for input from fliers who share my opinions about a national R/C helicopter group. He wrote to tell me that there once was a group, but the job of running it was too much of a burden for the founders to continue. Robert has spent time preparing a possible agenda for the group to start out on. His ideas closely parallel mine, so I must be on the right track. Robert is also the president and newsletter editor of the Washtenaw Helicopter Aero Modelers (WHAM), and he sent me a copy of his club newsletter, "The Helipad." It's very well-written and professionally prepared, showing that this is a flourishing, well-organized club. (Thanks, Robert.)

So please contact me if you think we should have a *national* organization for helicopter enthusiasts. If there's enough support, we should start a mailing list and start working toward our goals.

A package from Jim O'Brien of Springfield, VA, arrived recently, containing several back issues of the "Miniature Rotary Wings of Virginia News"—his clubs' newsletter. Members are searching for a local flying site, as they might lose the site they use now, because neighbors, disturbed by the noise, have complained to the police. This club encourages many activities, e.g., clinics, and members are kept abreast of happenings nearby. Organized flying activities seem to be "on hold" while they look for a new flying site. Good luck with your efforts, and thanks for the newsletter. I really do enjoy receiving these newsletters, so if you print one regularly, please put me on the mailing list. (I'll gladly pay for a subscription.) In addition, if your club is hosting an

activity and prints a flyer, please mail one to me; I'll try to mention it in this column.



Here's a helicopter attached to a set of inflatable floats, which is very effective in the event of a crash. For best results, keep the air pressure low.

Flight Basics

Last month, I promised to start a series of articles about flying a model, discussing everything from learning to advanced aerobatics.

I'll assume that you've just finished building your first model helicopter and have run through all the necessary bench checks. Be sure that you have some type of training gear attached to your helicopter skids. There are several types available, including two crossed wooden dowels with whiffle balls attached to the ends, or even a hula hoop attached to the dowels. Another method is to use inflatable floats, which usually include the appropriate hardware to attach them to the machine. These floats should be kept only about half inflated, so that they absorb the shock of hard landings. At any rate, be sure to use *something*, as it will reduce the time and money spent on repairs.

Next, head for the field—preferably with your trimming checklist in hand. Once there, you should choose someone to trim out your new model. Don't rush to grab the first person you see; watch the action until you see that your potential instructor is capable of flying his own equipment well. When learning to fly a model helicopter, you don't need much help from an instructor. All you really

need is some help trimming out your machine and some occasional advice about your progress. Don't be afraid to ask for help; most fliers are glad to check over a new bird and to lend a hand to a beginner.



Progress to moves like this one, where the helicopter is jumping forward. Never try to hold the helicopter in a stationary hover at this early stage of flying.

If you don't have anywhere to go for help, I'm sorry, as you really need to find someone to trim your machine for you. The only other way you'll ever decide if your setup is working well is strictly by trial and error. If you're *absolutely* on your own, carefully follow the steps outlined in the trimming guide published last month, taking your time with each one. Don't attempt a step that you can't accomplish comfortably. At first, have small goals and never try to rush the process, as haste usually leads to unnecessary down time and expensive repairs. As a beginner, you'll need to blend the trimming process with learning the basics of flight. Try to trim your model before concentrating on flight techniques. You should find that your helicopter gradually becomes easier to handle and to understand as you progress.

The most basic step is to learn what each of the controls on your transmitter does for your helicopter. Holding the transmitter in your hands, start with the left stick. Moving the stick vertically will

control the throttle and collective-pitch commands. As you push the stick away from you, the helicopter will rise, and as you pull the stick back, it will fall. This controls the speed of the engine and the lift of the rotor blades. Moving the left stick horizontally controls the yaw of the helicopter, so the helicopter can turn around the main shaft as it flies. Moving the stick to the left changes the pitch of the tail-rotor blades so that the nose of the helicopter rotates to the left; moving the stick to the right moves the nose to the right. (Note that this happens without moving the helicopter forward, backward, sideways, or up and down.)



Start with short "six-inch hops;" this method allows you to get the feel of the controls without risk of damage if you make a mistake.

Now, let's see what the right stick does. Moving the right stick vertically causes the helicopter to move fore and aft. (This is called the "pitch cyclic.") Moving the stick *forward* tilts the rotor disc forward, causing the helicopter to follow. Pulling the stick *back* makes the helicopter move backwards, and moving the right stick *horizontally* tilts the rotor disc from side to side. Pulling the stick to the *left* will tilt the rotor disc to the left and cause the helicopter to "roll" to the left; pulling the right stick to the *right* will cause the helicopter to roll to the right. (This is known as "roll cyclic.") Your first exercise is to confirm that all the controls do,

(Continued on page 124)

Quiet Flight

by JOHN LUPPERGER

AS I MENTIONED in last month's column, I'm taking a couple of classes at a local junior college. My computer DOS class is giving me a better understanding of the mysterious world of computers. Now, I'd like to ask all you computer programmers who work with model programs to send me information on what you're doing. I know that there are several programs available on airfoil plotting and sailplane design, and if you produce, or know something about, such programs, send me what you have and I'll pass it on.

Project Wanderer

Let's review what we've done so far. We've added triangle-stock stringers to the fuselage, cross-grain planked it (top and bottom), added a plywood plate support for the adjustable tow hook, and sanded it to a nice, rounded contour. The horizontal and vertical stabs were lightened by reducing the wood sizes, but we've maintained strength by adding diagonal ribs.

Depending on how much work you want to do, there are several possible modifications for the wing. The objective is to increase the wing's strength while increasing its performance potential.

To get your Wanderer wing ready for next month's building installment, look at the rib drawing. Note the darkened areas above the present spar notch and on the upper surface in front of the spar. These are the areas that we'll remove for turbulators and a full-depth, sheared spar.

The best way to mark the ribs is to stack the ribs in one tight bunch on the stock spar. Then take a piece of 1/8-inch-square spruce (the same material that will be used for the turbulators) and lay it across the ribs at the point where the turbulator notches are to be cut. Mark the top of the ribs on both sides of the spruce, then lift the ribs and cut 1/8-inch notches, making sure that they follow the contour

of the upper surface. After the turbulator notches have been cut, remove the remainder of the spar notch. To avoid confusion later, be sure to number the corresponding front and rear portions of each rib.

That's all for now. Next month we'll put it all together.

New Publication

Charlie Morey, Chuck Korolden, and Marcie Berriz of Signal Hill, CA, have put together a new publication for slope enthusiasts called, *Slope Soaring News*.* The first issue was a bit local in flavor, but I expect that as their list of contributors expands, so will their coverage. The first issue featured original and modified kit designs of many local fliers, and there were feature articles on Vince Parizek of Santa Monica Models, and on Dick Vader and his famous Vader Planes.



Steve Elliott's rather unusual-looking model started life as a scale Diamant. The original builder used the wing from the kit, but reconfigured it into a polyhedral gull model. It thermals very well and is exceptionally stable.

Vince Parizek's line of models might seem strange for an American model company, but it all makes sense when you realize that Vince is from Germany. His line includes a 4-meter ASW-17, a 4.2-meter ASK-23, a 4.4-meter Salto, a 2.8-meter wingeron ship called the Twister, and a high-performance model known as the Flair (available in three configurations from 2.5 to 3 meters). These models are available from Wilshire Model Center*. If you want more information, write to the proprietor, Bob Raztlaiff, for

prices and availability. Vince makes each model by hand and delivery can take up to a month.

This first issue of *Slope Soaring News* also features computer-generated graphics to illustrate the mechanics of performing a loop. This is very well done and a different maneuver will be shown monthly.

Each issue will feature a slope site as the "Site of the Month." There's a brief description of the site, giving location, lift conditions, landing area, and some indication of how friendly the local natives are (or aren't). If you're traveling, this section alone could be worth the subscription price (\$15.95 a year). Send your check to Charles Morey at *Slope Soaring News*, and mention that you read about it in *Model Airplane News*.

Kit Bashing...

...Or, "Doesn't anyone build kits as the manufacturer/designer intended?" Not many of us do, but some people take it to interesting extremes. Steve Elliott of Long Beach, CA, bought his rather unusual model already built. He didn't have any information on the original builder, but he thinks that it was built about 10 years ago.

I once had a similar scratch-built model—Borne Free. Its unusual polyhedral gull wing always attracted attention whenever I flew it. When I examined Steve's model, I was surprised to see that it was an old Soarcraft Diamant scale sailplane. Several years ago, I had an opportunity to fly a stock Diamant, and although it was very impressive and flew fairly well, it wasn't exactly easy to fly. Steve's model seems to use all the parts from the stock Diamant, but the wing panels were built to follow the gull plan form of the Borne Free.

Steve let me fly his model, and it really brought back memories. I was surprised

(Continued on page 64)

QUIET FLIGHT

at how easy it was to fly this high-aspect-ratio model: It had no tendency to tip stall and was very stable. It was also much easier to maneuver than the original straight-winged Diamant. Although this type of wing has more joints to make, it seems to work as well as a conventional polyhedral wing. Anybody care to try this plan form on a polyhedral model, e.g., a Gentle Lady?



The darkened areas on the drawing of the Wanderer airfoil are to be removed. These areas are where we'll add the spruce turbulators and the full-depth, sheared spar when we start building.

Test-Bed Model

A few years ago, I designed a two-meter model known as the Harlequin, which OK Model Co. of Japan (known here as Pilot) made into a kit. The original was intended as a test bed for different airfoils, but the only airfoil I tried on the model was a modified Eppler 205. It flew quite well with this airfoil and was kitted this way.

The fuselage was designed with flat, parallel sides in the wing-root area. As long as each wing panel is built with the main wing rod and secondary alignment rod the same distance apart, wings can be changed quickly and easily.

I've always appreciated the hard work and research done by Eppler, Quabeck and Selig, but I've always thought that computers and wind tunnels could give us only controlled information. Nothing beats actually flying the plane in the changing conditions we encounter at the field.

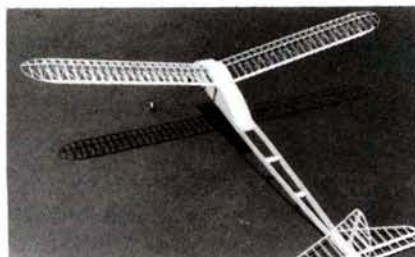
If you like to build, I *challenge* you to construct a Harlequin with several sets of wings, each with a different airfoil. To keep the weight the same, the wings should have identical structures. Some good airfoils to try are the Harlequin modified Eppler 205, a true Eppler 205, and Selig's 3021 improved 205, or any combination of airfoils that you'd like to compare. If someone does take up the challenge, we'll print the results here for everyone to scrutinize.

Speaking of the Harlequin, my flying buddy Dieter Lamprecht built one as an electric. To most people, this wouldn't seem like a very good choice for an

electric model: The Harlequin weighs about 40 ounces as a glider, but Dieter managed to build his .05-powered, 7-cell model at an all-up weight of 47 ounces—only 7 ounces more than the glider version, with 19 ounces of electric gear! At this weight, the Harlequin *really* performs. Most 2-meter electrics weigh 42 to 44 ounces and have a pretty good climb. At this year's Astro Champs, Dieter's Harlequin was one of the best climbing models: With its D-tube wing

and modified Eppler 205 airfoil, it's a very clean model, and it uses the available power to fly and climb faster than most other 2-meter electrics.

Dieter put lightening holes in the ribs, the rear of the fuselage, the fixed vertical, the rudder and the wing tips. He also



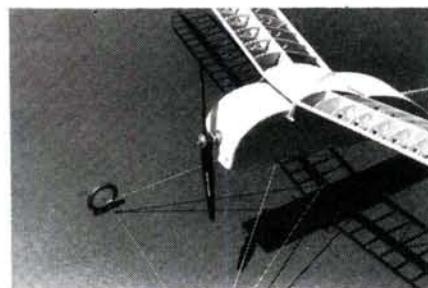
Randy Wrisley's 1936 Ehling Stick is certainly a different-looking model. Long tail moment and high-aspect-ratio wing make the Stick fly more like a glider.

replaced the ply fuselage sides with balsa and the $\frac{1}{16}$ -inch balsa wing sheeting with $\frac{1}{20}$ -inch sheeting. The Harlequin has a geared Astro .05, a 7-cell 900mAh flight pack, an electronic speed control, a 250mAh battery, a receiver and four micro servos (one on each flap, rudder and elevator). My point is that even if a model doesn't at first seem to be a likely choice, study it a while, work on lightening the structure, and you might end up with a real winner!

New Electric Old-Timer

Also at this year's Astro Champs, my friend Randy Wrisley commented that there *has* to be a better old-timer than the models now kitted: something cleaner for better handling and better performance. Randy has now come up with a 1936

Ehling Stick model—a somewhat obscure old-timer that doesn't look as if it would make a very good electric model. Its nose is too short, the tail moment seems too long, and at 70 inches, it only has 450 square inches of wing area. However, it has a flat-bottom airfoil with a good-looking upper surface, symmetrical tail surfaces, and a roomy fuselage.



Close-up of the Stick shows attention to detail in Randy's building. Lightening holes in the ribs and careful wood selection kept the Stick's all-up weight to only 32 ounces.

Randy set up the Stick with a geared Astro .035, six 800mAh batteries, three micro servos (one each on rudder, elevator and microswitch on/off), micro receiver, and a 100mAh battery pack. He covered the model in doped tissue for a finished weight of only 32 ounces.



Dieter Lamprecht's electric Harlequin. High-performance sailplane isn't a likely candidate for a 7-cell electric; Dieter put the Harlequin on a diet during building to end up with a 47-ounce flying weight.

I was with Randy for the test flight, and boy, was I impressed! With only a .035, the Stick's climbing performance was almost as good as those of the .05, 7-cell kit old-timers. The model's long tail moment and high-aspect-ratio wing make it handle more like a sailplane than an old-timer. Randy plans to build a .05-size Stick in the near future, and if he practices with this model, a lot of old-timer pilots are in for some fierce competition at next year's Astro Champs!

Till next time, good thermals and a full charge!

**Here are the addresses pertinent to this article: Slope Soaring News, 2601 E. 19th St., #29, Signal Hill, CA 90804.*

Wilshire Model Center, 2836 Santa Monica Blvd., Santa Monica, CA 90404. ■

D U R A C R A F T

Field & Bench Review

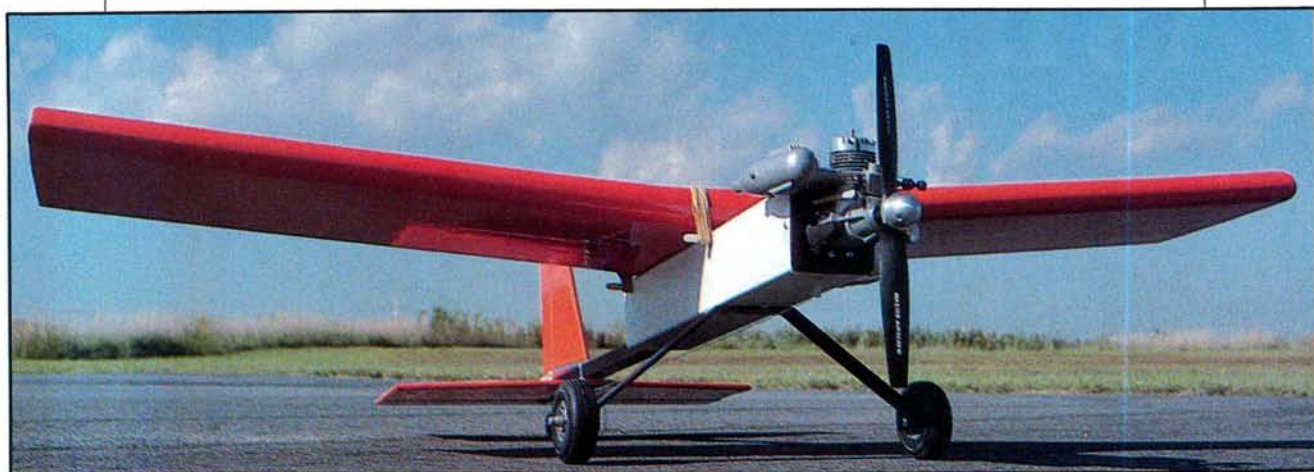
DURAPLANE

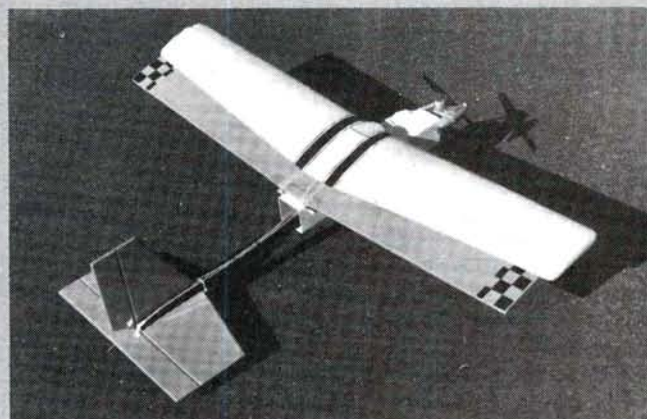
by RICH URAVITCH



UPDATED "COMPOSITE" TRAINER LIVES UP TO ITS NAME!

SUPPOSE YOU decided to develop a new R/C airplane specifically conceived to embody all the things that would make it an ideal first airplane for the newcomer to R/C flying. You'd probably consider ease of assembly, initial expense, cost of operation and two key characteristics: flyability and survivability. It seems Jeff Prince considered all these elements, and since he probably wasn't really keen on naming his company "Survivacraft," the Duracraft* Duraplane emerged.



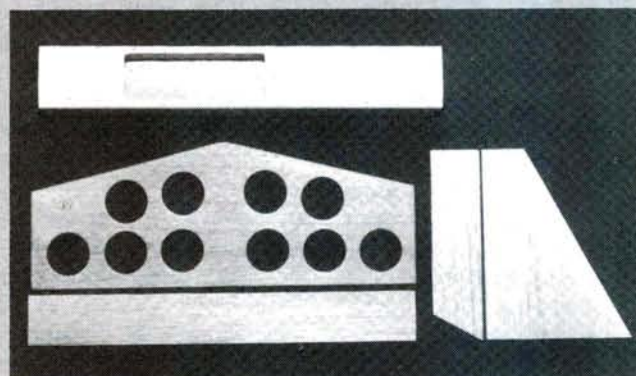


Original Duraplane wing shown on top of Duraplane II shows significant difference in wing area. Makes model more docile and easier to fly by reducing wing loading.

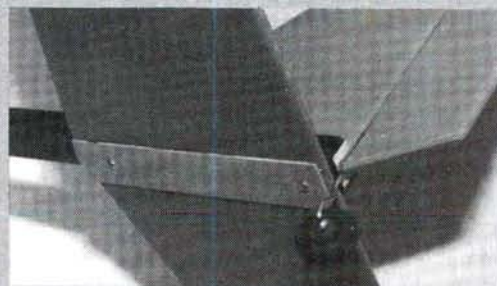
My first exposure to the Duraplane came about three years ago at the annual Toledo bash where Duracraft had set up their tent in the hallway between the two main exhibition halls. Every time I passed the spot, there was a crowd of people watching a video, their attention frequently expressed by an "Oh, no!" or "I don't believe it!" They were watching a number of different Duraplanes impacting on the ground from various attitudes and altitudes: things like spins from which no attempt was made to recover, *my* favorite maneuver, the Figure 9 (the inverted ground plow), and one that's meeting much resistance from the FAI pattern guys—the descending-height vertical post-hole digger. The presentation concluded with a maneuver that I call the "fossil,"

in which an attempt is made to immortalize the Duraplane forever by blasting it, full bore, into a cement wall to leave an indelible impression. I should mention that *that* was the only exhibition that appeared to render the Duraplane unflyable! So, great, you say, it *crashes* better than most, but how does it *fly*? Exactly my question. I can't give you a first-hand account, because I never flew one. I did hear from some folks who said that it was a bit of a handful for the new flier because the wing was rather small and the landing gear parted company more easily than expected, but it did seem durable. I guess Duracraft heard the same things and set out to improve the product. The result is the Duraplane II, the subject of this review.

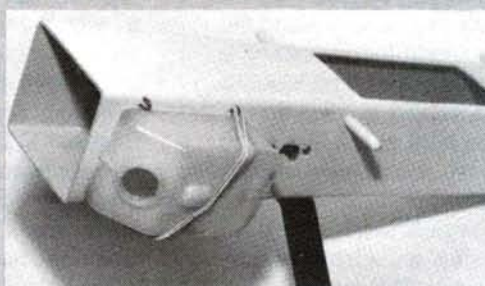
When you first open the box, your impres-



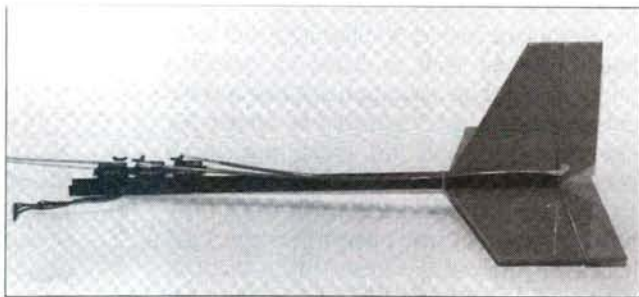
Balsa tail parts require only final sanding. Lightening holes were added to horizontal stab to reduce weight. PVC tube "fuselage" shown above.



Close-up of lower aft fuselage shows tail-wheel installation added by author. Easy to do; it helps in ground handling.



Forward end of fuselage shows old "UKIE" profile method of fuel-tank attachment via wire hooks and rubber bands. Fuselage section shown is PVC tube; no building, and fuelproof, too!



Fuselage "boom" with tail group attached. This assembly bolts to forward fuselage PVC tube. Nyrods drive control surfaces.

sion is that another box containing the rest of the parts should be around somewhere. Not to worry, it's all there, and rather complete it is! The size of the box was, no doubt, determined by the size of the molded foam wing, so the remaining pieces fit easily. After all, how much space can a piece of square PVC tubing, a length of aluminum channel, balsa tail feathers and a hardware package take up? The wing is larger than that of the original, which can readily be seen in the photographs—35 percent bigger, in fact. It's now rectangular in planform rather than tapered, and the airfoil is a good, thick flat-bottomed (almost Clark Y) section: lots of good lift, with enough drag to be appreciated by the beginner.

Assembly is adequately covered by a 14-page instruction manual, a supplement sheet and a parts list. No full-size plan is provided, nor is it necessary, given the low parts count and the simplicity of the design. A sheet of 20 photographs, keyed to the text, clarifies the sometimes less-than-straightforward instructions. I suggest that you read over the assembly sequence a few times to familiarize yourself with what you're about to undertake.

ASSEMBLY: This begins at the tail group and works its way forward. In my kit, the balsa for the horizontal stab and elevator was extremely hard, and consequently, rather heavy. I'd already decided that I was going to power the Duraplane with a .25-size engine, so I felt it was important to remove as much weight from the tail as possible to avoid having to add ballast to the front to correctly place the balance point (or CG). I accomplished this by cutting a number of lightening holes in the hard balsa. This is only a satisfactory solution if you intend, as I did, to cover the tail group with an iron-on film. The hard balsa also made installing the elevator hinges a bit of a chore, but with patience, you'll eventually prevail.

Before moving on to the radio installation, I added a tail wheel to the Duraplane by using an aileron-linkage bearing and a length of $\frac{3}{32}$ music wire. This assembly was attached to the vertical fin and rudder before I permanently installed the elevator. This installation is easy to do, and you'll find the tail wheel very handy to have for ground handling. One of the unique features of this design is the servo installation; I don't think you'll find another R/C

SPECIFICATIONS

Type: Sport trainer

Wingspan: 43½ inches

Weight: 3½ to 3¾ pounds

Wing Area: 391 square inches

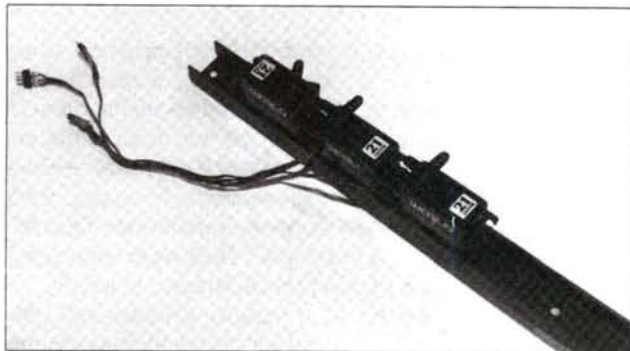
Wing Loading: 20 to 22 ounces/square foot

Power Required: .20 to .40, 2-stroke

Number of Channels Required: 3 (minimum)

Suggested Retail Price: \$79.95

Features: Simple assembly, low parts count, modular concept enables easy replacement of damaged parts.



Unique servo-mounting system. Fuselage "boom" is aluminum channel into which servo is press-fit. Works!

airplane that employs this method. The tail group, which we've just finished, is bolted and/or epoxied to an aluminum channel. This channel also acts as your servo "tray." The servos are friction-fit into the channel, three in line. I will admit to some apprehension about this method; I'm from the "epoxy rails in place and screw the servos to it" school. But, since this is a product review, I decided to see if it would work well, if at all. It does, but I'll tell you more about that later, in the flying section. The channel is sized to accept standard Futaba servos, but I used World Engines* S-21s, which are a gnat's whisker narrower, so I squeezed the channel together slightly and they fit just fine. The pushrod installation is covered quite well in the instructions, so I won't go into it here. Follow the directions, and you'll be in good shape.

I used a Magnum .25 from Hobby Shack*—a perfect powerplant for this application. It's powerful, reasonably priced and bears more than just a passing resemblance to the O.S. item of the same displacement. I installed the engine on a Dave Brown* nylon epoxy mount and then

(Continued on page 130)

READER REPORTS!

M I N I F I E L D & B E N C H

Here are two examples of our "Reader Reports"—a feature gaining in reader popularity at MAN. As you can see, Mark Suszko and Michael Noorigian took a few minutes to send in their impressions of the Duracraft Dura-plane, which we've presented as a featured "Field and Bench" in this issue. We would have liked to have seen a photo or two, but I guess the subject was too prefabricated, kind of like, "You've seen one, you've seen them all!"

The guidelines are easy; take a few photos of your model, write a few paragraphs telling us what you thought of the product and send your work in. Here's your chance to voice your opinion. Who knows? This might even launch you in a new career of aeromodeling photojournalism. If we use your report, the very least you'll receive is a complimentary subscription to MAN!

Here are some of the "Field and Bench" reports currently in the works. Let's hear from you.

- Ace 120-4 Biplane
- Bob Violett Models Viper
- Byron Originals Bullet
- Cambridge Pitts
- CGM Sophisticated Lady
- CGM Eagle II
- Dynaflyte Piece 'o Cake ARF
- GMP Thermal Charger
- Hobby Shack EZ "Dago Red" Mustang
- Hobby Shack EZ Decathlon 25
- Hobby Shack Skylark 40
- Kyosho Cap 21 ARF
- Polk's Model Craft ARF Cub 25
- Polk's Model Craft Sharp 45
- Sig Riser 100
- Sig Spacewalker
- Supersonics Predator
- Tidewater Pronto
- UMD Challenger
- Walt Moucha Models Charger MKII
- Yellow Aircraft A-4 Skyhawk
- Yellow Aircraft CAP 10

I hope this report is not too late! I can't say enough good things about my Duraplane. Let me just add that as I get better at flying, I won't abandon this model; instead, I'll use it as a test bed for new ideas (like an aileron mod to make it a fun-fly terror, or a biplane mod, like the "hots").

The thing is the essence of plane, and I can't help tinkering with it. Should I come up with anything earth-shattering, you can be sure I'll let you know.

I'm just a beginner, and my Duraplane (nicknamed "The Terminator") is so sturdy, it's "me-proof"! A 300-foot power-dive put me out two nylon gear bolts, a prop, and some CA glue—now, that's a value! This plane is OK as is, but I suggest these mods for those with non-Futaba radios:

• **Non-Futaba Adapter Plate:** My Aristo-Craft Challenger servos were too wide to fit into the aluminum channel like the Futabas. I made a long, T-shaped adapter plate from lite ply and balsa. The Aristo servos attach on their sides with double-stick tape, or epoxy, if you're really serious. The receiver and battery pack lay just ahead and are securely rubber-banded. There is just enough room in there, but with cut-down servo arms, it works great: Now the flight pack is a self-contained module that's easy to service. It also makes CG adjustments easy: slide the whole works fore/aft, or swap the heavy (battery) end to counter-balance a bigger engine. Drill a small setscrew hole through the AC side, and lock the whole works in position with a wood screw! A side

benefit is that the nyrods run closer to the AC for a neater appearance, and, with hand-bent brass clips, instead of tie-wrap to secure them, nyrod flex and resultant control slip are eliminated.

• **Engine Module Modification:** Drill extra holes through the fire wall and run the tank flush up against it, using the brass tubes for support. This makes the engine/fuel system one unit: no foaming problems, and it makes installation/maintenance easy.

• **Tail Wheel Modification:** A stock tail wheel makes ground handling better. I let mine free-caster, with no control attachment: rudder input works great!

• **Nylon Bolts:** Nylon gear bolts have saved my Duraplane from fuselage damage. This was the main

READER REPORTS!

reason the manual advises not to use gear.

- **Instruction Manual:** The manual is full of typos, and doesn't mention some things an unassisted beginner should be told; e.g., sanding edges on tailpieces for hinges and airfoils.

- **Wing:** I had an early (but unwarped) wing, which I reinforced with fiberglass running spanwise on the underside—sturdy as a rock. While the plane flies great with my Como .29, recovery from spins is sometimes painfully slow. Next time I break the wing, I'm testing aileron cutouts to improve roll rate.

My Duraplane flew perfectly from the first day, straight off the bench. It works as advertised. With mods, it turns from trainer to fun-fly monster! Should be a great ship for one-class combat flying, too!

Mark Suszko
Springfield, IL

I recently completed a Duraplane I. My reaction upon opening the box was that there were very few pieces to put together. It was obvious that this was not "construction" as much as assembling a few parts.

The instruction booklet was very helpful. It was clearly and intelligently written. I saw only one obvious error. In the section concerning installing a .20 to .25 engine, there was a reference to wrapping the Tx in foam, instead of the Rx. Incidentally, my version of the instruction manual was dated June 1987.

The quality of the accompanying photo was another matter. This was apparently a photocopy of photographs. The details weren't at all clear and, in some cases, the photos were of almost no help. This was particularly a problem when it came to figuring out which end of the fuselage was the front. The written

instructions weren't specific on this point and the photo was of no help. After a while, you realize that the front is cut at an angle, which allows for built-in downthrust when the motor is attached to it.

The kit goes together easily and the parts all fit. My main problem occurred in balancing. While the instructions indicate the point of balance on the wing, the wing location on the fuselage is not clear. The problem arises because the fuselage is a box and the wing simply sits on top of the flat surface. The wing can be moved forward and backward between the hold-down attachments for the rubber bands. I chose to place the wing midway between the hold-downs. Similarly, the instructions recommend attaching the fuel tank to the outside of the fuselage with rubber bands. It is, however, easily moved about when so attached. In addition to the rubber bands, I used some double-stick tape to fasten the fuel tank.

I installed a K&B .20 Sportster per the recommendation. It fit perfectly, and the radial motor mount, which is included with the engine, saves the cost of purchasing a motor mount. I deviated from the recommended method of installing the control surfaces. The tail feathers are simply 1/4-inch sheet balsa. Rather than chiseling hinge slots, I glued on Redi-Hinges (by Fourmost Products). This is simplicity personified. I did, however, cut down the tail surfaces to compensate for the hinges, such that the total surface area of the tail feathers remained unchanged.

After installing the landing gear, it was apparent there was a problem. This plane is a tail-dragger. No mention was made of a tail wheel. As I saw it, the tail would simply drag across the ground. The location of the elevator was such that it would bounce along on the grass, placing

stress on the hinges and control rods. I installed a one-inch tail wheel, which I allowed to swivel freely, rather than attempting to couple it to the rudder.

At the field: The plane wouldn't taxi. It just sat there. I replaced the recommended 2 1/2-inch wheels with 3-inch wheels. Now the plane moved, but the movement consisted of rotating on the wheel axle and digging the nose into the ground every time the throttle was opened up. It would not taxi on the grass. The only solution was to remove the landing gear. I attempted to hand-launch. The plane glided gracefully to the ground. Several additional throws convinced me that there wasn't enough engine power. Incidentally, the glide was flat and straight. Finally, when the engine mount broke upon landing, it was time to stop.

Back again at the field with an O.S. .30 up front. With a hand-launch, it was off and flying. When throttled back, it flew slow and straight. Altitude drops off sharply with rudder-only turns, but is readily corrected with elevator.

My first landing was in a tree (some pilot error and some inability of the plane to turn crisply into the wind). Other than a chink in the foam wing, the plane was perfectly intact. In retrospect, this suggests that the strapping tape, which they recommend be applied to the wing, should be added to the leading and trailing edges and not just full span.

Overall, the simplicity, ruggedness and cost make this plane a good choice. None of the problems I encountered would discourage me from starting on a second plane; this time, the new version with ailerons.

Michael Noorigian
Leonia, NJ



Photos by Budd Davisson.



Everyone starts someplace

by BUDD DAVISSON

TRAINERS

WHEN IT COMES TO SURVIVAL, the instructor and the airplane make an invaluable team. With the right airplane, the team is infinitely stronger and produces a student who knows much more than what lever to pull and which knob to twist. The right instructor/airplane combination produces a pilot who has a feeling for the delicate interface between machine and sky. Regardless of how good the instructor is, you need the right training airplane.

First, the airplane should be matched to the mission. The military figured that one out when they divided training into different categories. Primary students trained in the PTs, basic pilots in the BTs, and those ready to go into combat/support aircraft used the ATs, or advanced trainers.

In any category, the airplane should be easy to fly, but not so easy that the student masters it too easily and outgrows it too quickly. For instance, even though a student could



solo a Cub in six to eight hours, he could spend years learning to fly it really well. Like all the classic trainers, it offers challenges of its own, but the challenges match the student's level of proficiency.

The airplane should be consistent in its performance and the student should be able to apply what he learns to other aircraft. A case in point would be the advanced Air Corps students who progressed through P-39s (which a few did) on their way to other combat aircraft. The nose wheel didn't teach them anything, since they'd never see one on a fighter, and the strange dynamics resulting from the mid-mounted engine made it capable of doing things that couldn't be duplicated with other planes.

What trainers have stood the test of time? Most are obvious; a few are not; and I'm certain nobody will agree with my list. Just bear with me and take a crack at me later in the letters column.

● *J-3 Cub.* I'd be surprised if everyone's list didn't start with the Cub. For 50 years, it's been the trainer by which to measure all others. By today's standards, it may be hopelessly antiquated and uncomfortable for the instructor, but the Cub can still teach things that today's trainers can't.

For instance, the student knows from the first minute of instruction that his feet must coordinate properly or he'll be doing slow circles on the ground at the end of each landing



roll-out. In fact, without proper use of the feet, the student won't even move the airplane away from the gas pump. In the air, unless he uses his feet properly, the adverse yaw will make him sick, because he's so far aft of the CG and he'll be slewing back and forth.

With the Cub, the student is able to "feel" the flight. If he uses too much angle of attack on climb, he won't have to look at the air speed to tell if he's too slow; the "soft" feeling in the stick tells him. If he's too fast, the message comes through the same way.

A Cub is both the easiest and the most difficult trainer to fly. It will forgive a student's mistakes, but it will also make him work very hard to fly a precise line. He must be right on profile and be coordinated every second.

In short, it demands that he fly as he's supposed to.

● *PT-17/N2S Stearman.*

If there hadn't been wars, it's doubtful the old Boeing "Kaydet" would have become a classic. It's too big and too expensive to have made it in a civilian market that had discovered the Piper Cub. However, the factors that made it big and expensive are exactly what made it so well-suited to the military training command.

First, it was built like a bridge—a very strong one. Absolutely nothing a student could throw at would bend it. And if, by some herculean effort, it was bent, its structure was so simple, it would be back on the line the next day.

There are no known in-flight failures of a military Stearman; in fact, there are documented stories of bored instructors pointing them straight down just to see how fast they would go. The word is it would get to terminal velocity and just sit there, its huge amount of drag refusing to let it go any faster even though pointed right down at the ground.

The Stearman could be really cantankerous, if the student forgot what his feet were for. It made him aware of how important it was to keep the nose in front of him, but it did so at speeds in the 50mph range. This stood him in good stead when he put a Mustang on the runway at close to 100mph, where the consequences of letting it get crosswise were much more dramatic.

● *North American "Texan" (AT-6/SNJ).* The fact that the Texan is still training students for foreign governments 50 years after its birth is probably its strongest recommendation.

As an advanced trainer, the -6 was second to none in preparing a student for higher-horse airplanes. It was totally consistent in its *bad* habits, which were scaled-down vices of bigger airplanes. It would snap to the outside if the student went too slowly for the "G" he was pulling. Go too slowly in any situation, and the dazed student would find himself twisting into a spin.

However, no matter how the student messed up the airplane, he only had to apply the techniques he'd been taught and the airplane would recover obediently. The airplane always did

exactly what was asked of it. Nothing more, nothing less. It always assumed the student knew where the edges of the envelope were and, if he ventured past them, he knew the consequences and how to get back.

The Texan also gave the student the "big-airplane" feel. There was no doubt he had his hands on a mini-fighter, even though it had to huff and puff to get to 160mph. It smelled and looked like a fighter, and it went a long way toward preparing a pilot for a Mustang or Warhawk.

The Texan was also capable of being "difficult." The gear was narrow and the airplane tall, making a very unstable situation. The only thing the student could be sure of on landing was that

the airplane would swerve. He didn't know which way, or when, but it was going to swerve and he had to be ready for it. It must have been a relief to fly a Mustang or other fighter since they handled so much better on the runway.

The Texan's strength and relative simplicity are part of the legend. They are also the reason so many of them are still around and are still training students.

● *Cessna 120/140/150.*

Although it sticks in my throat to say it, the ubiquitous little Spam-can Cessna is this generation's Cub. Because so many 150s were built, they kept the cost per flight hour down to practical levels.

Structurally, the 150 is anything but robust, and if it

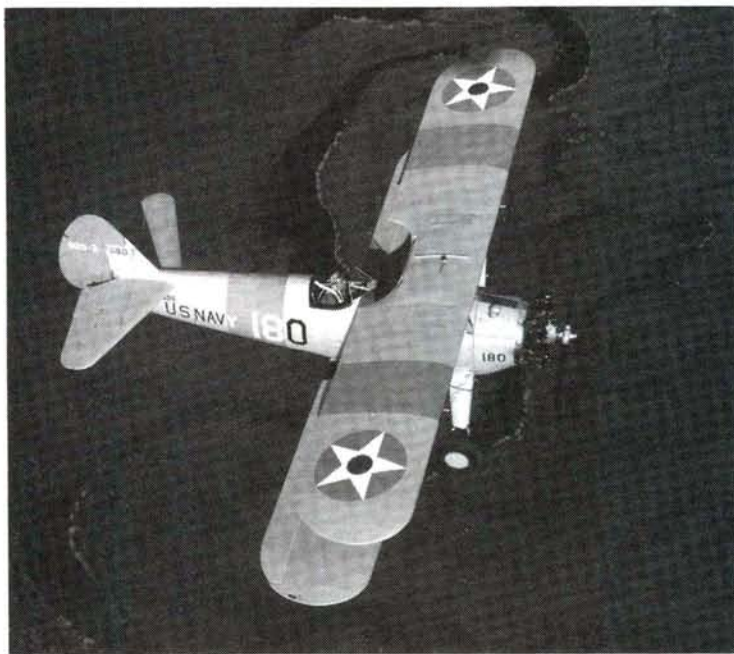
wasn't for Steve Wittman's marvelous invention of the spring steel gear, the airplanes wouldn't have survived the training environment for long. However, the gear takes the bangs and bounces, protecting the airframe nicely.

The 150 is even easier than the Cub to fly and comes close to the "drive it up, drive it down" concept of flight training. A student can easily be talked through a takeoff and landing his first time out. In fact, that's probably one of its flaws; it's too easy to fly and doesn't offer quite enough challenge. However, the 150 is light, and if the wind isn't friendly, the student has to fly the airplane all the way down. Also, the 150 has the appeal of a Studebaker Lark. Yes, it does the job, but no one wants to be seen getting out of one.

● *S-2A Pitts Special.* The Pitts is an advanced trainer in every sense of the word. If the student doesn't already have a good handle on aviation before disappearing into the Pitts' pit, he'll be intimidated by the airplane. If he already knows how to fly, the Pitts will be the high point of his career.

Although there were a number of excellent aerobatic trainers before the S-2 came along (the Citabria being foremost among them), the Pitts was the first to open the doors to advanced/unlimited aerobatics. Before the Pitts came along, there was practically no place a person could go to do outside loops, inverted spins and some of the other ridiculous stuff many of us think of as

(Continued on page 80)



Put the PRIDE
INSIDE

DISCOVER SPACECASE

A New Beginning..

EXTERIOR
NOW
ASSEMBLED

You design
the interior

Holiday Special: Act now and receive a multi-compartment parts box, absolutely free!! Offer expires Dec. 31st 1988.

See your DEALER
or contact:



MATRIX
ENTERPRISES INC.

DEPT. 01
7015 Carroll Rd.
San Diego, CA 92121-2212
(619) 450-9509



FULL-SCALE TRAINERS

(Continued from page 77)

necessary fun.

Also, the Pitts was the first available high-performance tail-dragger trainer that could be used in training someone to fly any of the single-place home-builts. Before the Pitts, a pilot would probably train in a Luscombe that landed at 35mph, then go strap on his newly completed single-hole Pitts that touched down at 65 and zigzagged like a sidewinder. There was no comparison, but he had no choice. A lot of airplanes were bent, and pilots were terrified on those first flights.

Although a totally uncivilized machine from a creature-comforts point of view, the Pitts two-holer flat gets out and boogies. Here's an airplane that's impossible for a pilot to break, it will do every aerobatic maneuver in the book and it's available around the country. More important, the airplane is one of the most docile, forgiving machines ever designed (in the air, that is). It always gives the pilot lots of opportunity to recover from anything, and, even in a bad situation, it will recover, if the pilot just lets go.

On the runway, it's quick—really quick, and really blind! But that's mostly a matter of perception. It always challenges the pilot to keep it straight, acting as if it's going to bite his leg off if he doesn't pay strict attention. (And it will.) But, at the same time, it gives both the student and the instructor enough control to make corrections and sort things out. All of this, however, happens at lightning speed, which is as it should be. After this airplane, the student is qualified to fly just about anything with a tail wheel.

So, that's my list and, yes, I've missed a lot of airplanes called trainers, all of which have trained thousands of pilots. But every list has its winners and losers, and by limiting mine to five airplanes, we had to make some drastic cuts. Yes, the Fairchild PT-19/23/26s were good trainers, and somebody out there is saying the same thing about the PT-22, or the Porterfield, or the Funk, or...But I'm sticking to my limit—this is *it*. Just to show I have an open mind, I'll put together a list of the *second* five based on your comments, so let's hear what you have to say. ■

NOW EVERYONE CAN FLY THE ULTIMATE R/C HELICOPTER... ... ON YOUR COMPUTER.

From the complete novice to the world's best, the Radio Control Helicopter Simulator for IBM PC's and compatible computers is designed to give you a taste of R/C helicopters without the time and expense. With just a few simple keystrokes you can configure your own helicopter; over 180 billion different combinations possible.

Imagine flying inches off the ground without having to worry about a costly engine or radio failure. Loop, roll and fly inverted without having to spend time to adjust linkages.

This simulator makes a great training aid for beginners. Also, seasoned veterans can brush up on their skills and try maneuvers that they wouldn't dare try at out the field.

Flying the helicopter is done with a full size 'transmitter'. The display shows your chopper as you would see it if you were actually flying. The helicopter has autorotation, inverted, and full aerobatic capabilities.

An aircraft version is also available. It features dual rates and can be configured to fit any flying style.



*Also available for Apple 2, 2+, 2e, 2gs,
and Commodore 64/128 computers.
Will not work on the Apple 2c.*

This program & dual joystick 'transmitter' combo requires the use of an IBM PC, XT, AT computer or compatible, equipped with a game port (15 pin plug), and a CGA or EGA graphics board.

DAVE BROWN PRODUCTS

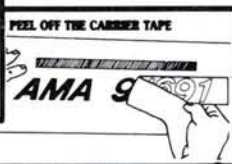
4560 Layhigh Rd., Hamilton, Ohio 45013 • Ph: (513) 738-1576

VINYLWRITE CUSTOM LETTERING

Providing an elegant, time saving and economical finishing touch for modelers.

• EZ TO APPLY •

Our lettering comes to you pre-spaced & pre-aligned. Saves hours of cutting & the fuss of aligning individual letters. These are not decals. Your text is custom computer cut in 3M Premium cast vinyl • only 2 mil thin • vertical or horizontal text • custom lengths • 15 colors • 6 typestyles inc. Military Block • slanted or upright text • 1/2" to 12" high



Priced right with no minimum charge!

For example, you can have your AMA number in 2" high text, any color, for only \$3.00 + \$1.25 P & H.

Call or write for complete info pack & sample. IT'S FREE!

All orders processed upon receipt and shipped via first class mail.

VINYLWRITE CUSTOM LETTERING

16043 Tulsa Street

Granada Hills, CA 91344

(818) 363-7131 (Noon to 6 PM Pacific) • Mail order only! CA res. add tax. •

Fly

VINYLWRITE Custom Lettering
on your model today!

SENIORITA

(Continued from page 50)

it's rather worn and not as powerful as some newer engines of the same, or slightly smaller, displacement.

I chose a Tower Hobbies* System 500 "Silver" 4-channel radio, and installed this using the methods described very thoroughly in the instruction manual, which also includes information on several methods to connect the pushrods to the servos.

PERFORMANCE: *Beautiful!* The

Seniorita accelerated slowly at first, and this was later determined to be the result of the wheel collars being too tight. Liftoff was smooth and level. After climbing to a reasonable altitude, only a few clicks of rudder trim were necessary. The first flight lasted till the tank was dry; it was beautiful—this big plane gently turning in the sky, making passes for photographs. The first landing was dead stick—a smooth, gentle touchdown. The Seniorita tends to float on landing, and so requires prior planning on approach to prevent it from floating right past the runway. Since

that initial flight, I've flown the Seniorita at least 15 times. The power of the .25 engine and the rudder, elevator and throttle control are more than adequate, and ailerons are neither offered nor necessary.

I've tested the capabilities of the Seniorita as a "hands-off" trainer. On several occasions, I put the Seniorita in a bad attitude (a condition that I sometimes suffer from) and it corrected itself, as the construction manual/flying guide claimed it would. I found a young flier at the field who was having trouble flying his father's

(Continued on page 84)

NEW MARK III - The "ROLLS-ROYCE" from Germany

The FK 50 is a scale version of the world-famous Continental engine that was used in many popular early light aircraft. This alternate firing 4-cycle RC engine is virtually free of vibration and very economical in fuel consumption. Only the finest materials have been used in its production. **The FK 50 is the only engine available where methanol alcohol and oil is located separately; the lubrication is made by an oil pump.**

We have improved the FK 50 performance essentially which led to the **MARK III-gold** version, a further development of the MARK II. The MARK I and MARK II versions are discontinued.

The special features of the **MARK III-gold** are higher rpm, better idle and smoother running. It is available with ignition or glow version.

The KAVAN "Thyristor" spark ignition version operates on the Hall effect principle and uses two magnetic pickups, one for high speed operation and the other to retard the spark timing for starting and low speed operation. It allows easy non kick back starting, excellent low speed idle, and maximum full throttle power. The electronic system eliminates the use of moving contact points and accomplishes this with two thyristor magnetic pickups.

Specification

Displacement:	3 cu. in. (50 cm ³)
Induction system:	4-cycle, Mark III, o. h. v.
Bore:	1.34" (34 mm)
Stroke:	1.10" (28 mm)
Maximum rpm:	8,800 rpm glow version/9,200 rpm with ignition
Idle rpm:	1,600 rpm glow version/1,400 rpm with ignition
Horsepower:	4.4 glow version/4.6 with ignition
Propeller:	20 x 10" (determined by aircraft)
Weight:	5 1/2 lbs (2450 g) glow version/5.73 lbs (2600 g) with ignition
Fuel consumption:	16 oz (500 cm ³)/20 min.

The FK 50 with ignition can be operated with either regular GASOLINE or methanol fuel.



KAVAN FK50

Retail US \$ 1,200.-

ONLY US \$ 995.-

Catalogue US \$ 5.- plus shipping

PRICES SUBJECT TO CHANGE WITHOUT NOTICE



KAVAN, 2052 Newport Blvd., Suite 9/1, Costa Mesa, CA 92627



ZAP UNIVERSITY

COLLEGE OF GLUE KNOWLEDGE



Prof. Sticky VonShtuck



Flex Zap

Perfect for fiberglass to hardwoods or fiberglass to fiberglass. Not a wonder drug...you must provide excellent fit. Do not use Kicker with Flex Zap. Allow up to 3 minutes to dry. One or two drops squeegeed out are all that's needed. Overglueing causes longer drying times. Strongest CA available. Doesn't work on porous materials like balsa. Super for mounting race car tires to rims!

Pacer Tech, Campbell CA

MOONEY 201

2" SCALE — 70" SPAN
7 1/2 to 8 1/2 LBS.
ENG. .40 - .60 2 CYCLE
— .90 4 CYCLE



\$139.95
+ Shipping

- Machine Cut Parts
- All Balsa Kit
- Full Size Plans
- Factory Approved 3 Views
- Jig Built Flying Surfaces
- Complete Hardware
- Ply Capped Cowl, Wing Saddle & Surfaces
- Complete Construction Manual
- Complete Decals



To order call or write:

GM Plastics, Inc. / 7252 Industrial Park Blvd. / Mentor, Ohio 44060 / (216) 953-1188

SENIORITA

(Continued from page 82)

plane, and I let him get some stick time on the Seniorita. Its largeness and calm, slow flight characteristics allowed him to orient the Seniorita and to think about his control inputs. His response? "I want one!" I think that sums up the Seniorita's suitability as a trainer.

*Here are the addresses of the companies mentioned in this article:

Sig Manufacturing Co., 401 S. Front St., Montezuma, IA 50171.

Top Flite Models, 2635 S. Wabash Ave., Chicago, IL 60616.

Carl Goldberg Models, Inc., 4734 West Chicago Ave., Chicago, IL 60651.

Tower Hobbies, P.O. Box 778, 1608 Interstate Dr., Champaign, IL 61820.

SPORTY-SCALE

(Continued from page 25)

received a replacement from Uncle Sam. Finally, when you make your documentation booklet, remember that its overall appearance will somehow affect your score even though it's *not* supposed to. If you hand the judge a worn, torn, faded book with coffee stains and bird droppings on it, it will be difficult to convince

(Continued on page 92)

THE RC HELICOPTER CHALLENGE!

DOES THE CHALLENGE OF FLYING RC HELICOPTERS INTRIGUE YOU? THEN YOU SHOULD FIND OUT ABOUT GORHAM MODEL PRODUCTS, INC.

- GMP specializes only in RC helicopters.
- GMP has the widest range, the best parts and technical support.
- GMP helicopters have proven world-beating performance.

PLUS, over 1,000 hobby stores nationwide handle our product.

WANT TO KNOW MORE?

Then please send \$2,00 for an illustrated catalog.



1987 - 1988 ACHIEVEMENTS

- 1st place World Championships
- 1st place U.S.A. Nationals
- 1st place Canadian Nationals
- 1st place British Nationals
- World altitude record 5,988 ft.

Gorham Model Products, Inc., 23961 Craftsman Rd, Calabasas, CA 91302, TEL (818) 992-0195, FAX (818) 702-0117

CARL GOLDBERG MODELS



VECTOR

Type: Trainer

Wingspan: 59 inches

Wing Area: 630 square inches

Length: 46 inches

Weight: 5¼ to 5½ pounds;
as built, 5 pounds, 5 ounces

Power: .35 to .45 2-cycle;

.45 to .61 4-stroke

paper (240 and 320 grit), a hand drill, drill bits, Allen wrenches, pliers, small screwdrivers and a modeling iron for applying covering material, if you choose *not* to paint the model.

CONSTRUCTION: First read the instruction book, which discusses everything from radio selection to covering and even your first flight—all supported by numerous useful photos and illustrations. Follow the construction sequence as indicated: tail surfaces, elevator, stab, vertical fin and rudder. Glue the dorsal fin to the vertical fin, and when this has been completed, mark and install as instructed.

The leading edges are already shaped for you, so sand the elevator end and

THE SERVOS GO ABOARD THIS ARC TWO BY TWO!



Photos by Chris Abate.

by CHRIS ABATE

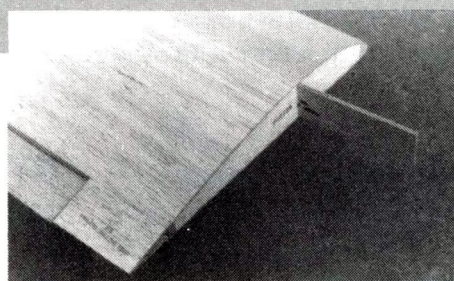
THE VECTOR, by Carl Goldberg Models, Inc.*, is a sport trainer with full-house operation: ailerons, elevator, rudder and throttle. The Vector is also an "ARC" (Almost-Ready-to-Cover) kit, but unlike most ARC kits, the Vector kit contains a set of full-size plans, which are a great help when you install your first radio.

The Vector is about 95 percent pre-built, so my article is fairly short! You'll need some additional items not included in the kit: a 4-channel (or more) radio; a .35 to .45 2-stroke or a .45 to .61 4-stroke engine; a propeller; a fuel tank and fuel tubing to suit the engine. As well as this, you'll need: a 2¼-inch spinner; 10 feet of covering material (24-inch-wide material); three 2½-inch wheels; foam rubber to pack the receiver and battery pack; wing-seating tape; a box of No. 64 rubber bands; and of course, adhesive. All of these can be found at your local hobby shop. The tools needed include: a modeling knife, a sandpaper block and sand-

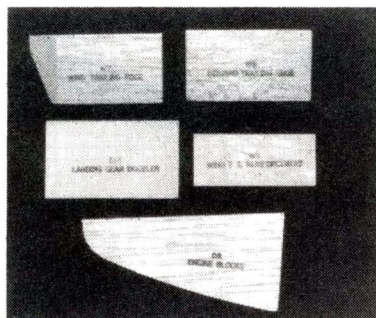


rudder top to match the existing shape. Next comes the wing, which has a cut-foam core with balsa-skin sheeting. (Relax; it's already sheeted!) You just have to add the trailing edge inboard and the outer trailing-end piece, and then repeat the procedure for the other wing half. Check to see if you need to trim the ends of both ailerons to fit between the inboard and outboard trailing-edge pieces. Like the rudder and elevator, the ailerons are pre-shaped.

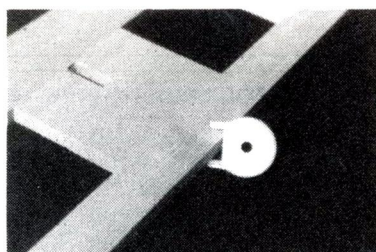
Next join the wing halves; a joiner slot is pre-cut in the foam to allow insertion of the joiner spar. Glue the



Left: Pre-sheathed foam wing with joiner spar, ready for gluing to other wing panel.
Far Left: Completed Vector awaits covering.



All parts are stamped with part number and nomenclature.



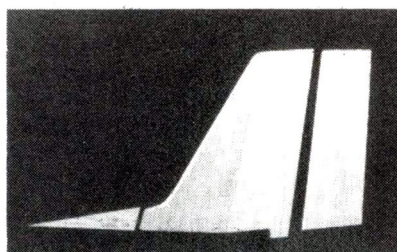
Included with the hardware package is a Goldberg center-line hinge-marking tool. Ensures centering of hinges on trailing edge.

joiner spar and the wing halves together with epoxy; when this is dry, apply 2½-inch-wide, nylon, center-section reinforcing tape as indicated. Your wing assembly is now complete!

Now the fuselage construction: Just remove it from its plastic bag! Engine installation follows, and you should follow the instructions carefully and install the plywood engine mount correctly. The mount has been pre-cut at an angle to ensure a proper engine-thrust setting. Add the bottom nose doubler and sand it to blend with the existing nose contours, and the fuselage is complete. It's taking longer to write about it than it took to build!

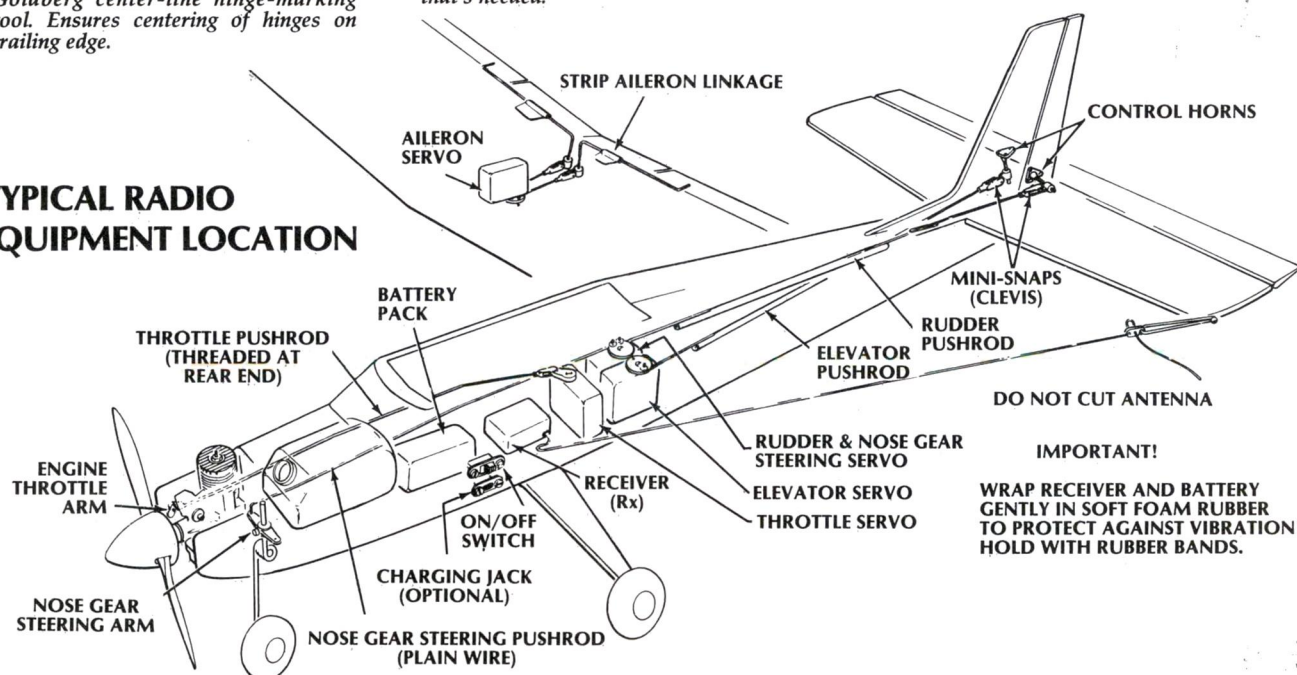
Attaching the landing gear comes next. The holes for mounting the nose gear to the fire wall are pre-drilled, as is the throttle linkage hole, and a hole has also been cut in the fire wall for the fuel lines to pass through. In the bottom of the fuselage, drill two holes for the main

landing gear. The holes in the aluminum main gear have already been drilled. Finally, glue on the tail surfaces. See; all very simple! Even the servo rails are cut to size. Before covering, install the radio gear: This is fully explained and well illustrated in the instruction book.



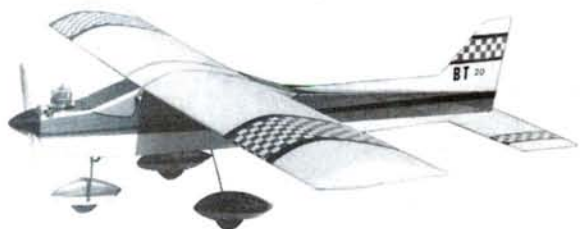
Tail surfaces as received; hinging is all that's needed.

TYPICAL RADIO EQUIPMENT LOCATION



FROM **DAVEY SYSTEMS** . . . A pair of really slick trainers with all of the little hassles of building taken out of the box before you open it!

These birds are as simple to build as they are pretty to look at. The small parts as well as the sides and tail feathers are pre cut and ready for quick assembly. You'll be in the air, and flying on your own, faster then you ever expected.



BT-20 A three channel trainer for 15-25 engines. Has a fully sheeted flat bottom wing that can be built with the optional ailerons. 50" span. 400 sq. in. area.

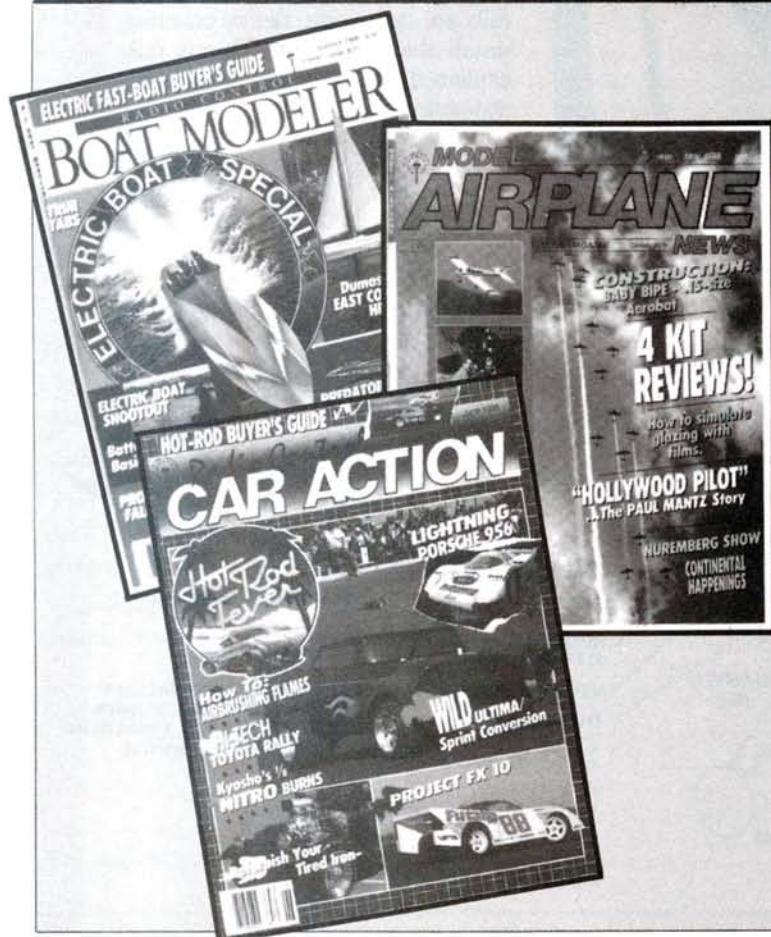
AT-50 A four channel advanced trainer for 19-30 engines with a "scale" look that flies rock stable like a pattern bird and has a wide speed range. Has a 50" span semi-symmetrical airfoil with a 400 sq. in. area.



Both kits feature rolled plans, step-by-step instructions, hardware, wheel pants, formed gear and accurately die and machine cut selected woods.

**DAVEY
SYSTEMS
CORPORATION**

675 TOWER LANE
WEST CHESTER, PA 19380
215-430-8645



A SPECIAL MESSAGE TO RETAILERS

IMAGINE the benefits of drawing many more regular customers into your store every month. Imagine adding a popular, **profitable**—and returnable—hobby product to your store. By stocking **Model Airplane News**, **Radio Control Car Action**, and **Radio Control Boat Modeler** you'll accomplish both! These are the most informative and entertaining modeling magazines available to the R/C consumer—and they're in tremendous demand. These magazines will actually stimulate more sales of R/C Airplanes, Cars, Boats and accessories for you.

If you're not already stocking Air Age magazines, please call us toll-free and we'll let you know how they can make money for you.

Call Yvonne Toll-Free at

1-800-243-6685

(in CT 203 834 2900)

(dealer inquiries only)

Air Age Publishing • 251 Danbury Road • Wilton, CT 06897

The Vector.TM

Someday, all pre-built models may be built this well.



THE VECTOR (KIT 54)
WINGSPAN: 59"
WING AREA: 630 sq."
LENGTH: 46"
WEIGHT: 5 1/4 - 5 1/2 LBS.
POWER: 35-45 two-cycle
45-61 four-cycle

The Vector is more than just a great-flying sport-trainer.

It's also one of the best-built, almost-ready-to-cover planes you could ever hope to find.

Real model plane construction with performance to match.

One look at the kit, and you'll know why it's the kind of pre-built we're proud to put our name on.

The Vector's precision-assembled balsa-and-ply fuselage, balsa-sheathed foam wing and accurately cut balsa tail surfaces all add up to the same kind of smooth, predictable performance and practical repairability you'd expect from a model you'd carefully built yourself.

The only difference is, the hard part's already done.

Real plans and instructions, too.

Unlike most pre-builts, the Vector comes with



Your Vector can be ready to cover after one evening of assembly.

a set of full-size plans and complete instructions. So there's no guesswork when it comes to equipment installation or assembly.

And if you ever have to make a repair, you won't be guessing about its construction or dimensions, either.

You design the finish the way you want it.

This is no pre-printed, "cookie-cutter" model, so you'll be covering your Vector with the material you choose, in the colors you like best.

Peel-and-stick window decals are included, plus we help out with some design suggestions to make things even easier.

See the Vector at your local dealer's

soon. It's got everything you could ask for in a sport-trainer. Plus it's the kind of pre-built you'll be proud to put your name on, too!

CARL GOLDBERG MODELS INC.

SPORTY-SCALE

(Continued from page 84)

him that you're displaying a perfect model. Just like going to a restaurant; might be hard to believe they have the best chops in town, when the roaches are playing volleyball next to the refrigerator!

I hope this column will provoke a few responses that I can then deal with in another column. I look forward to your comments; just send your stuff to me, care of the magazine. Pictures are OK, too, but I can't promise to show all of them, nor can I return those that aren't accompanied by a stamped, self-addressed envelope.

Until next time... Check your six. ■

TRAINER 40

(Continued from page 28)

depend mainly on your choice of engine. Be sure to set your CG according to the specs.

I'm very pleased with the Model Tech Trainer 40H. The instructions are clear, the construction of high quality and the parts fit. You can't ask for much more from any kit.

If the 40H is deficient in any respect, it's that some accessories found in other kits aren't included. In all fairness, however, price is also a consideration, and the Model Tech 40H is reasonably priced. You have to provide the fuel tank and tubing, hinging material and engine bolts. Three 2 1/4-inch wheels are also needed. This doesn't stop me from telling you that the Trainer 40H is a good investment for learning to fly and, sometimes, just what you might need to relax and take a break from the usual.

**Here are the addresses of the companies mentioned in this article:*

Model Tech; distributed by AMS Imports, Inc. 1110 S. Wells Ave., Reno, NV 89502.

World Engines, 8960 Rossash Ave., Cincinnati, OH 45236.

MonoKote; distributed by Top Flite Models, 2635 S. Wabash Ave., Chicago, IL 60616.

Futaba Industries, 555 W. Victoria St., Compton, CA 90220. ■

E-Z BEE

(Continued from page 37)

turn that ended up dead center in a soccer goal net. Neat catch! Score one point for the Bee.

On the next flight, I took back one turn on the elevator clevis, and the airplane made a Bee-line for the aforementioned bulrushes. The entire patch of reeds was only 75 feet square and the Bee found the

(Continued on page 100)

ZAP UNIVERSITY

COLLEGE OF GLUE KNOWLEDGE



Prof. Sticky VonShtuck

Zap Lock

Blue Formula is medium strength. Green Formula is high strength. Developed for locking metal fasteners or nuts and bolts. Parts treated will not loosen due to vibration. Blue Formula great on all sizes of threads. Green Formula is too strong for anything 6/32 or smaller! Blue Formula can be loosened with hand tools. Green Formula is history! Only high heat application can loosen bond.



Pacer Tech, Campbell CA

**At last.
The Ultimate Pilot.
Completely finished,
equipped, poseable,
and ready to fly.**



Pilot	Bust 1/4 scale	Full Figure 1/6 scale
WWI	\$19.95	\$29.95
Civ/Sport	19.95	29.95
WWII	19.95	37.50

Add \$3.25 P&H per item.
California residents add sales tax.

New! Black pilots available.

mga enterprises

P.O. Box 5631, Fresno, Ca. 93755
(209) 224-4170

SLIMLINE MUFFLERS



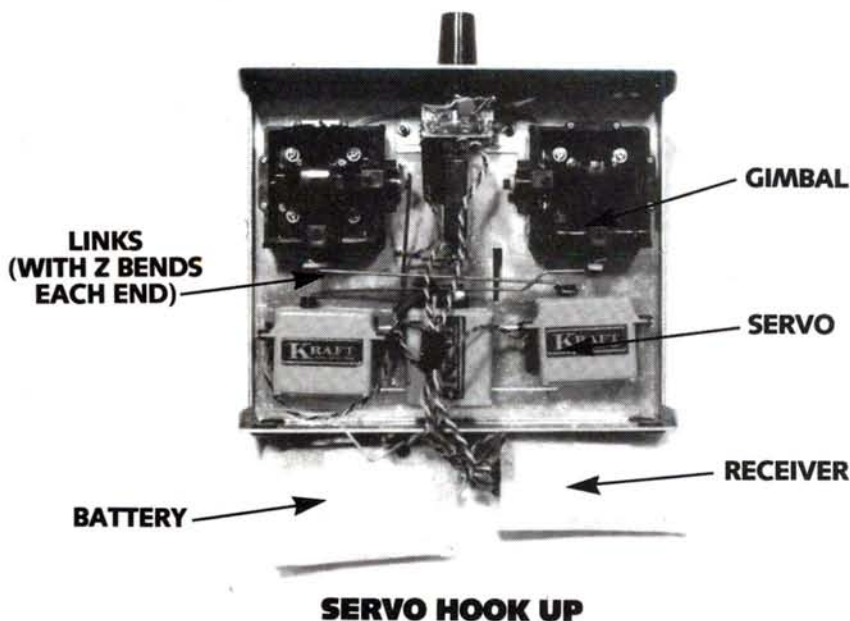
SERIES II PITTS STYLE MUFFLER

- Quiet • Full Power Range • Bolt-On Or Strap On
- Low Restriction • Machined To Fit Your Specific Engine
- Constructed Of 6061 T6 Alum • Superior Craftmanship

FREE CATALOG P.O. Box 3295, Dept. 1
Scottsdale, AZ 85257

SHADOW BOX

(Continued from page 59)



Outwardly, the Shadow Box resembles a transmitter. The innards, however, consist of flight-pack components: receiver, batteries, switch, servos and the transmitter gimbals. The servos drive the gimbals instead of the aircraft's surfaces. Simple! (See the pics.)

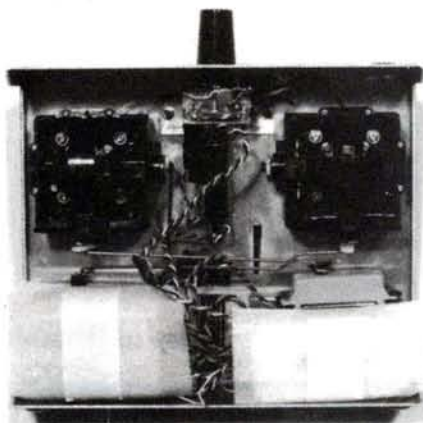
Our modifications to the box were quick and messy, as our objective was just to try out a prototype. (The picture shows the servos sticky-taped into position.) The linkage from the servos to the gimbals is 1/16-inch wire with a Z-bend at each end, and our biggest job was to modify the gimbals. They were re-worked by sawing off the pot (disassembly isn't required), drilling and tapping the sawn-off end of the shaft, and bolting on a modified servo arm (see sketch). This friction-fit assem-

bly of the arm allows the gimbal sticks to be exactly adjusted to the neutral position by "pushing a little harder," so relieving you of having to disassemble the box to exactly center the sticks.

While arranging the servos, remember that the batteries and receiver had to be stuffed into the same space, although they *could* be mounted outside the box. The result is a neat package; an antenna isn't necessary, but might be added for appearance.

As always, after the first prototype, you want to make changes. Adding frequency-change capability is the revision that would provide the biggest reward. This could easily be accomplished by bringing a crystal plug to the outside of the box. (We didn't bother to ask Ron if he'd mind us cutting up his receiver!) Servo-reversing is another possible addition, as are an external plug and jack arrangement between the servos and the receiver to allow simple switching for different pulse-function sequencing between transmitter manufacturers (e.g., Futaba and Airtronics). Each improvement (and there are lots more possibilities) takes time, but they're worth considering, especially by clubs. Best of all would be an integrated transmitter/Shadow Box connected to a duplicate transmitter/Shadow Box via cable, set up so the instructor has full override, and "box-switching" wouldn't be necessary. This would neatly combine all the advantages of the Shadow Box and trainer cord systems.

We hope we've helped the sport with this idea. If you try it or want help, send us a line. ■



BATTERY AND RECEIVER STOWED

ZAP UNIVERSITY

COLLEGE OF GLUE KNOWLEDGE



Prof. Sticky VonShtuck



Plasti Zap

Formulated for all plastic model construction. Great for ABS or Butyrate. Loves vinyl. Super on ABS to balsa. If kicker is used, use very sparingly. A little goes a long way. Don't overglue.

Pacer Tech, Campbell CA

NORTH AMERICAN YAT-28-E

1 1/2 SCALE — 66" SPAN — 60" LENGTH
7 1/2 to 8 1/2 LBS. — ENG.: .60 - .80

- Machine Cut Parts
- Complete Const. Manual
- All Balsa Kit
- Complete Decals
- Full Size Plans
- Complete Hardware
- Factory Approved 3 Views
- Ply Capped Cowl, Wing Saddle & Surfaces
- Jig Built Flying Surfaces
- Scale Spinner & Prop Blades



\$159.95
+ Shipping



To order call or write:

GM Plastics, Inc. / 7252 Industrial Park Blvd. / Mentor, Ohio 44060 / (216) 953-1188

E-Z BEE

(Continued from page 92)

exact middle of it. I wonder if Cox makes an ARF machete?

Beginning with flight two, the pitching tendency became acute, as did the turn almost immediately upon release from the arm-strong catapult. It would run away from me, trying to twist hard right and pitching up at the same time. With no elevator trim, all I could do was react to the turning. The flights never got further than second base, and most twisted into the ground short of the pitcher. It wasn't a question of losing control: I never *had* it, because the airplane never presented a situation stable enough on which to base control inputs.

Hard Crash I

After trying to get it trimmed, the Bee finally climbed high enough for it to hurt itself—a perfect 10K vertical at the end of a spiral. Damage report: clean break in the fuselage at the landing-gear notch under the cowlings covers. Repair time: Eight minutes, including epoxy set-up time and cutting fiberglass strips.

Radio Control Buyers Guide

The Most Complete Guide in the World of Radio Control



The 12th Edition of the Radio Control Buyers Guide is available direct from Kalmbach!

Now you can own the source book of radio control modeling information — the Radio Control Buyers Guide! In more than 300 pages, and thousands of product listings, this all-new 12th Edition of the Radio Control Buyers Guide provides the up-to-date information every radio control enthusiast needs — whether you're a beginner or a NATS champion. There's no other R/C book source like it! #24626

- Aircraft • Cars • Boats • Radios • Systems • Engines
- Hardware • Books • Videos • Finishing materials
- Accessories • R/C dealers • Plus much more!

\$11.95
ORDER TODAY!

Kalmbach Publishing Co., 1027 N. 7th St., Milwaukee, WI 53233-1471

YES! Please send me _____ copies of the **Radio Control Buyers Guide**! Price per copy is \$11.95/#24626.

☐ My check is enclosed.

☐ Charge my credit card

Charge to: ☐ Mastercard ☐ Visa

Name _____

Card # _____

Street _____

Exp. date _____

City, State, Zip _____

Signature _____

Include for postage and handling: U. S. \$1; foreign \$1.50. Make payment in U. S. funds. Wisconsin residents add 5% sales tax.

0019

Hard Crash II

After the repair, the Bee was about 75 feet out, when it got into a particularly vicious porpoise and spiraled down on its nose again, hard! Damage report: Major! The engine punched through the plastic fire wall, all the screw bosses broke through the cowling, and the nose foam compressed. Repair time: one hour, including fabrication of a new plywood fire wall and glassing the nose foam.

With no ability to control pitch, the airplane presented too many variables that were out of my hands. Often, when I went for rudder, I got elevator, and that was the *last* thing I needed! So, I gave in, stuffed an elevator servo into the fuselage and went back out, determined to get this thing trimmed.

This time, Jenny and I stood on the top of a hill with a long, flat field below and, for 45 minutes, did nothing but hand-launch the airplane with no power, so we got good at flying the thing around, power off. It became clear that the controls were effective only within a very narrow regime, so I moved the rudder pushrod in several notches to give more rudder throw. It was also clear how sensitive the airplane was to trim and how comparably *insensitive* it was to control inputs.

Early the next morning, in cool air that was so "fat" it practically picked the Bee up off the ground before starting the engine, I put in about 15 flights—if you can call them that. Even though the airplane was almost perfectly trimmed, it refused to do anything the same way twice. On one launch, it would immediately roll over on its back and dive for my toes. On the next, it would act like a Wakefield with ten strands of Pirelli and gently spiral up to altitude, giving me all day to work with it.

During this one session of flying, I shinned up a big tree, soaked a pair of cowboy boots mucking through a swamp, and blazed a soon-to-be well-worn trail through a bramble patch that even Brer Rabbit would have left alone. A cop was watching the proceedings from the safety of his patrol car, and I'd look up periodically to see him laughing like a loon as he described my actions over the radio to his cohorts all over the township.

Hard Crash III

Of the 15 or so flights that day, only a few got higher than a telephone pole before the Bee got a mind of its own and veered off in one direction or another. I knew what I was *supposed* to be doing, but the airplane just wasn't answering the helm.

(Continued on page 107)



FOR THE R/C BOAT
ENTHUSIAST

ON NEWSSTANDS
AND IN HOBBY
SHOPS EVERYWHERE



FOR THE R/C CAR
ENTHUSIAST

ON NEWSSTANDS
AND IN HOBBY
SHOPS EVERYWHERE

WHAT
ACE R/C
charger will
charge two 1-
10 cell packs
from 100ma
to 2500ma
capacity...and
with a
variable rate
up to 250ma
?



How did you guess?

34K32 Ace DMVC, Kit
34K32C Ace DMVC, Asbl.
Complete Catalog \$2.00

ACE R/C
116 W. 19th St., P.O. Box 511 E12, Higginsville MO 64037
(816) 584-7121

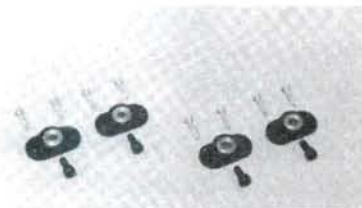
Product News



CONLEY PRECISION ENGINES CONLEY 1.2

From famed 1/4-scale V-8 engine builder Gary Conley comes the first in a series of high-performance, precision-built model engines. Designed to be a powerful, durable and low-maintenance model-aircraft engine, the new Conley 1.2 has features you'd expect to find only on European supercars, like belt-driven, dual, overhead cams, utilizing the race-proven cup-and-disc system of valve adjustment. This eliminates the use of less efficient pushrods and rocker arms that are forever in need of adjustment. In addition to this high-tech valve train, paired, hardened and ground steel intake and exhaust valves improve "breathing" and work in unison with a hard-chrome cylinder that reduces weight and increases engine efficiency. Conley engines are made in the USA, utilize only standard SAE threads and are available directly from Conley or through dealers nationwide.

For more information, contact Conley Precision Engines, Inc., 820 Ridge Ave. Suite G, Lombard, IL 60148.



SIG MANUFACTURING WHEEL-PANT MOUNTS

Fitting wheel pants to wire landing gear can now be done quickly and easily

using Sig's new wheel-pant mounts. Available in two sizes to fit 1/8- or 5/32-inch-diameter wire landing gear, these mounts are thin enough to fit inside the pant next to the wheel. Made of durable nylon with machined-brass inserts, the mounts are packaged in sets of two, with four mounting screws and two socket-head screws so you can really tighten down hard on the axle. If the wheel pants strike something the wrong way, the unique design of these mounts allows them to rotate, so possibly saving the pant from damage.

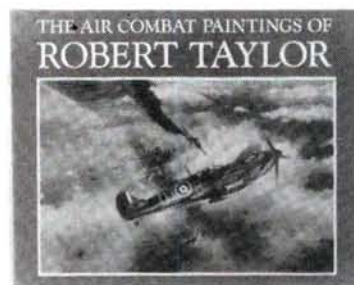
For more information, contact Sig Manufacturing Co., 401 South Front St., Montezuma, IA 50171.



K&S ENGINEERING PRO-LUBE OIL

This is a premium-quality oil with exceptional lubricating qualities for the finest performance, and it's especially designed for the 2-cycle and 4-cycle engines used in model airplanes, cars and boats. Pro-Lube Oil neutralizes acids resulting from the combustion of glow fuel. In doing so, it protects the metal parts by providing an invisible barrier against corrosion. The oil penetrates quickly, frees sticky mechanisms and restores smooth operation to moving parts in hard-to-reach places. It also provides a protective coating for internal parts of the engine while it's in storage.

For more information, contact K&S Engineering, 6917 West 59th St., Chicago, IL 60638.



EXECUTIVE HOBBIES ROBERT TAYLOR BOOK

At last! A lavish, large-format, luxury-bound book of Robert Taylor's work. For many years now, museums, art galleries, the book trade and private collectors all over the world have been pressing for a comprehensive volume of Robert Taylor's famous aviation paintings. Measuring 14 1/2 x 11 1/2 inches overall, the book contains 48 color (24 full-page) reproductions and over 800 black-and-white reproductions of Taylor's paintings, pencil drawings and diagrams.

For more information, contact Executive Hobbies, Inc., P.O. Box 34, Livingston, NJ 07039.



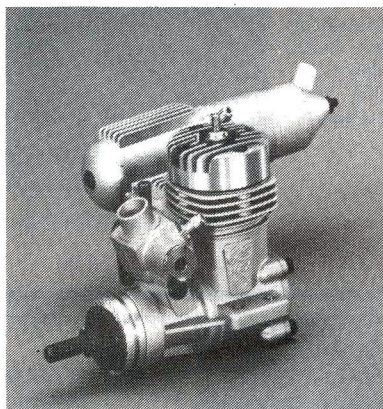
JOHN SULLIVAN FLOAT FLYING—THE VIDEO

John Sullivan Model Floatplane Products has recently released the first video shot exclusively for float fliers. The 1-hour, 55-minute VHS-format tape is titled "Float Flying—The Video" and will be of interest to beginners or experienced float enthusiasts. There are segments on design, mounting, covering, control mechanisms and operation. In addition, the video features coverage of Clearlake '88 (the largest floatplane meet in the world), plus exposition and flight sequences of dozens of floatplanes from lazy old-timers to screaming pattern ships. The

Descriptions of new products appearing in these pages were derived from press releases by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by **Model Airplane News**, or guarantee product performance. When writing to the manufacturer about any product described here, be sure to mention that you read about it in **Model Airplane News**.

video was shot with 380,000-pixel Sony equipment and is duplicated at real time.

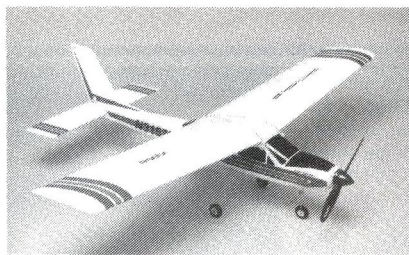
For more information, contact John Sullivan Model Floatplane Products, 1421 2nd St., Calistoga, CA 94515.



O.S. CZ-A ENGINE

The CZ-A is O.S.'s latest addition to its fine line of .10- to .15-size engines. The CZ-A is designed to give outstanding performance and yet be simple enough for a beginner to operate. It features Schneurle porting, ABC construction, a ball-bearing-supported crankshaft and an expansion-chamber muffler. It also has a specially designed carb to take the guesswork out of engine adjustment.

For more information, contact Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.



KYOSHO CESSNA CARDINAL

Kyosho strengthens its position in electric R/C flight with the introduction of the 1/19-scale Cessna Cardinal. This 47-inch-span plane is a very stable flier, an ideal electric trainer, and a perfect choice for new fliers. (Its pre-built design adds durability and minimizes building errors.) The one-piece fuselage and balsa wings and tail are pre-built

and pre-covered. Included are a LeMans Stock 05 motor, control rods, prop, spinner, decals and adhesive.

For more information, contact Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.



BIO-PAK ASSOCIATES CRAFTIP

Bio-Pak Associates has introduced the new, innovative Craftip snap-off blade-cutter/pen/burnisher combination for professional and amateur artisans. This new dual tool saves time and simplifies crafts, artwork and general hobby work. This handy, compact cutter-and-pen tool has a safe, convenient flip-over cap that covers the blade when the pen is used and covers the pen when the blade is used. The cap can also be used as a burnisher to smooth decals or apply striping tape for painting.

For more information, contact Bio-Pak Associates, P.O. Box 2280, Farmingdale, NJ 07727.

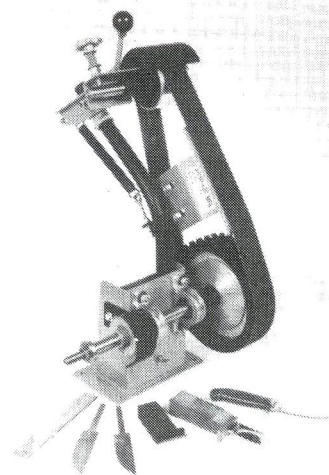


FUTABA ARF ELECTRIC CHIPMUNK

The new Hirobo/Futaba Chipmunk brings a new level of performance to electric-powered R/C flying. The almost-ready-to-fly kit has been carefully engineered to easily perform precision aerobatics in the hands of advanced pilots. The Chipmunk will execute loops, rolls and stall spins, and it flies inverted, just like the full-size plane. It's

90-percent assembled out of the box, with pre-covered fuselage and wings. Also included in the kit are landing gear and all the necessary linkages and hardware. Pushrods and motor mount are factory-installed, so reducing construction time. The Chipmunk has a wingspan of 47 inches and an area of 360 square inches. It weighs 2.65 pounds with recommended radio system, and has an overall length of 35.5 inches.

For more information, contact Futaba Corp. of America, 555 West Victoria St., Compton, CA 90220.



SPEED-CUT MFG. SPEED-CUT GRINDER

The new Speed-Cut Grinder is built to stand up to any kind of grinding or buffing job. If you're into making your own parts or working with metal, you'll appreciate the importance of a sturdy, rugged grinder like the Speed-Cut. It's built stronger than it has to be; its base assembly utilizes two heavy-duty pillow blocks with sealed, high-speed ball bearings and lube fittings supporting a large, 1-inch-diameter main shaft. Key features include positive tension and tracking controls, which eliminate the possibility of belt movement, plus an adjustable work rest that can be removed for freehand grinding.

For more information, contact Speed-Cut Mfg., 333 College Ave., P.O. Box 399, Ephraim, UT 84627. ■

E-Z BEE

(Continued from page 101)

On the final (and I do mean *final*) flight of the day, it yielded to gravity in a near vertical path from 50 feet. Damage report: Fuselage broke clean right at back of cowl, wing broke just outboard of middle joint. I carried the pieces back to the car and made a passing comment to the cop about how much easier it is to fit it into the car in that shape. Repair time: one hour, which included glassing the trailing edge where the rubber bands were trying to cut it in half on each crash.

At this point, I was really frustrated. Then salvation came, in the form of a major discovery! While doing the fuselage repair, I noticed that only a minor tap on the rubber spinner was enough to move the servos up out of their pockets. The rudder servo seemed especially willing to dislodge. Further investigation showed the servos only had to move a quarter of an inch or so vertically to radically change the airplane's trim. That meant each hard landing (which means *every* landing) probably moved the servos, which would account for the airplane's inconsistency. I yelled up to Jennifer that it was the airplane—not her

(Continued on page 108)

ZAP UNIVERSITY

COLLEGE OF GLUE KNOWLEDGE



Prof. Sticky VonShtuck



Slo-Zap

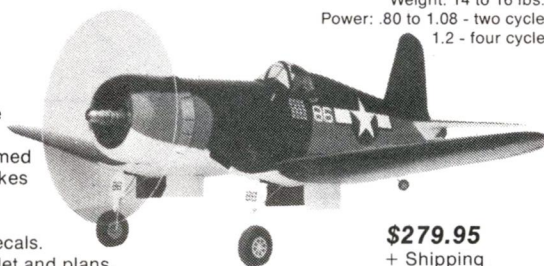
Thickest formula. Set time: up to 60 seconds. Loves hardwood and plywoods. Great for fiberglass to wood. Very strong. Forms nice fillets. Skin balsa wings easily: put Slo-Zap on ribs, spray Zip Kicker on wing sheet, put together, and smooth out with palms. It's easy!

Pacer Tech, Campbell CA

F4U CORSAIR

71 1/4" span, 58 3/8" length 920 sq. in. wing area
35 oz. per sq. ft. wing loading
Weight: 14 to 16 lbs.
Power: .80 to 1.08 - two cycle
1.2 - four cycle

- Finished fuselage - .062 Aircraft Quality ABS over a crutch & ply bulkheads.
- All bulkheads including the 3/8" ply firewall are installed.
- Foam wing design with formed ABS Gull covering that makes the wing a snap to build.
- Built up tail feathers.
- Complete hardware and decals.
- Complete instruction booklet and plans.

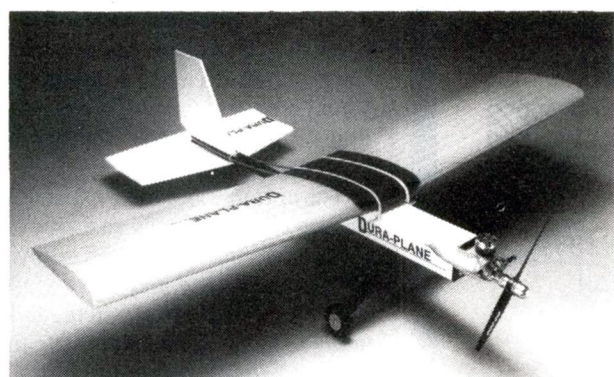


\$279.95
+ Shipping



To order call or write:

GM Plastics, Inc. / 7252 Industrial Park Blvd. / Mentor, Ohio 44060 / (216) 953-1188



Wingspan 45-in. For .20 to .40 engines and 3-channel control.

Introducing Son of Mr. Rugged



Duracraft, Inc.

1007 Orchard Grove Drive
Royal Oak, MI 48067

The second generation of the most durable model airplane on the market has arrived.

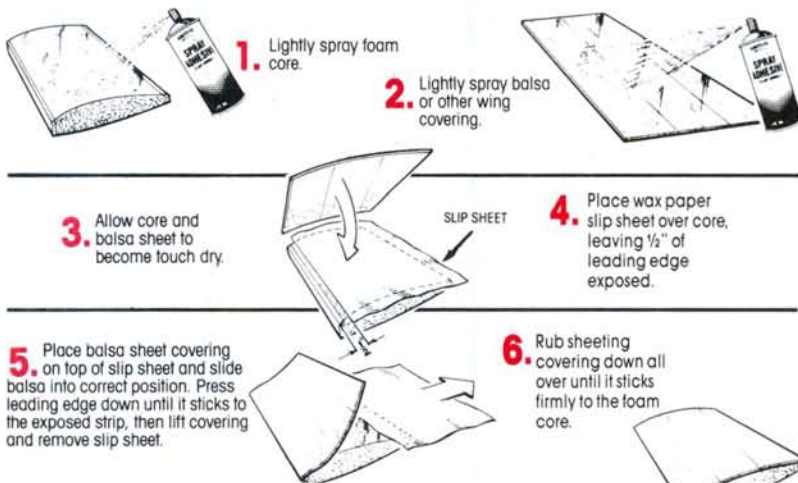
A new high-lift wing, even more rugged construction than before and simplified assembly make the **DuraPlane II** the easiest and most forgiving way in the world to become a model airplane pilot. Since the original **DuraPlane** came on the market two years ago, we've been listening to what our customers have to say. From your suggestions and our own research, we've refined our original design and we invite you to try the most unique model trainer available.

The new **DuraPlane II**—watch the skies for it!

LOCTITE® Techniques

LHC-04 SPRAY ADHESIVE

New Spray Adhesive bonds wing skins to foam cores, laminates balsa sheets and works anywhere else that ordinary spray adhesives work with one big exception... *ours works better and we guarantee it!* If you're not completely satisfied with LOCTITE® Spray Adhesive, simply return the unused portion to us along with your sales receipt and we'll refund your money.



Available at quality hobby shops everywhere.
Loctite is a registered trademark of Loctite Corporation © 1988

Coming Soon

The New Yat Trainer

- Simplified construction
- Watch for our new release.

G.M. Plastics
7252 Industrial Park Blvd.
Mentor, OH 44060
(216) 953-1188

ZAP UNIVERSITY

COLLEGE OF GLUE KNOWLEDGE



Prof. Sticky VonShtuck

Z-Ends

An extending reach, slick tip for Zap glues. Allows you to get into hard-to-reach areas. Comes packed with 10 Z-Ends and a 12' coil of special micro dropper tubing in a neat little reusable clear plastic container. Use the micro dropper tubing on Zap CA, Plasti Zap, and High Strength Zap Lock. Use the Z-Ends on other products.



Pacer Tech, Campbell CA

E-Z BEE

(Continued from page 107)

dear, old R/C clown of a father—causing some of the problems.

Aha! This was a major advance! Searching for a quick method of nailing the servos in place, I poked some holes through the fuselage with a sharp welding rod and laced the servos in place with copper wire. I know it's crude, but the wire fit in very nicely with the rest of the garbage-can ambiance the airplane had acquired through its weeks of physical abuse.

This time out, it was like a different airplane! Despite a rising wind, I got five engine-run flights back-to-back before retreating. After the first one, I moved the rudder pushrod to the inside hole on the rudder horn, and that, combined with my newfound aerodynamic repeatability, gave me an airplane I could actually control, and one on which to see my mistakes.

In those last five flights, I gained an entirely new appreciation for the EZ-Bee. Although I'm not sure of the value of the combined elevator/rudder setup, and the two-stick situation does complicate things somewhat, in general, I think the airplane finally began teaching me what I needed to learn. I'm going to continue flying the airplane until what little is left of it is gone.

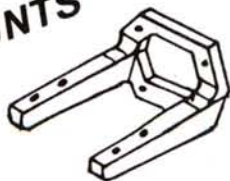
As a trainer, the airplane's brute strength and ease of repair are two of its strong points. Throw it at the ground; stomp on it; let a herd of ground squirrels drag it through their burrow—it still comes back for more.

The airframe looks like expanded polystyrene, but it's actually an exotic blend of unbreakonium and quickfixalloy. Put a tube of 5-minute epoxy and a few square inches of fiberglass tape in the flying kit, and you have an airplane that can never be totalled by anything but a close encounter with a lawn mower.

As the airplane comes out of the box, it's a little short of what it should be, and it's those few things that gave me so much trouble. A few changes should be made to the airplane before even taking it to the field. First, move the rudder pushrod to the inside hole on the rudder horn, but leave the elevator on the outside one. Even with one servo, this gives it more rudder authority than elevator, and that's what it needs. With two servos, it gives much better control harmony. Second, do whatever you can to keep the servos in place. The factory now puts a dab of glue under them, but not all kits have that feature. This is important: Stop the servos

(Continued on page 110)

IS MODEL SPECIALTIES **TATONE** for precision Aluminum **MOTOR MOUNTS**



FOUR CYCLE

Alloy Alluminum
Machined Beams

Drilled & Tapped
90° Thrust Line

O.S.

FS-20 \$7.50
FS-40/40S 8.95
FS-48 9.95
FS-60/75/90 12.95
FS-61 12.95
FS-120/120S 19.95

ENYA

35/40-4C \$8.95
46-4C 8.95
60/80/90/
120-4C 12.95
120-4C 21.50

SAITO

FA 40/45 \$8.95
FA 65 12.95
FA 120 19.95

HP

VT-21 \$7.50
VT-49 8.95

WEBRA

T4-40 \$8.95
TA-60/80 12.95

Undrilled

60-90 \$11.25

TWO CYCLE

Machined Beams
Engine Mounting
Bolts Incl.

1/4 Sh Bm \$3.90
1/4 Lg Bm 4.10
.09 4.75
.15 Lg Bm 4.95
.19-3.5CC 5.85
.29-40 Lg Bm 6.80
.40-61 Sh Bm 6.50
.40 RV Pylon 7.75
.60 Pattern 10.25

GIANT SCALE

Alloy Alluminum
Machined Beams
Engine Mounting
Screws Incl.

OS Max 90 \$19.25
OS Max 1.08 19.95
Super Tigre-2000,
2500 & 3000 19.95
Zenoah G-38 19.95
Quadra 35/40 21.50

C.B. TATONE, INC.

21658 Cloud Way • Hayward, CA 94545
In CA 415-783-4868 • Out CA 800-482-8663

If not available from your hobby shop, ORDER DIRECT. Check, MO, VISA, MC or COD accepted. Add \$2.50 for S&H, 2.00 for COD. California residents add 6% sales tax.



"F-100"

*1/8-Scale
*Flying WT. 11.5 lbs
*Accessories Avail.
*Wing Span 50"
*Length 63"
\$169.99

Kits include fiberglass fuselage, vacuum-formed canopy (F-100), foam wings, plans, and construction manual. No wood included. Accommodates Dynamax or Byro-Jet Fans. Free shipping within 48 states.

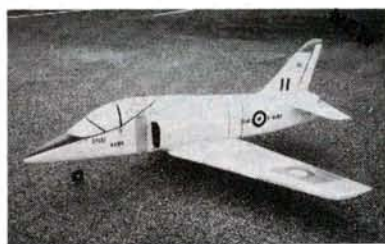
1/4-Scale Main Retracts

22 Ounces

Spare Parts

89-94 Deg. Retract Angle

Air Tank, Service/Selector Valve,
and Airlines are Included
\$199.99



"SPORT HAWK"

*Length 59" Wing Span 51"
*Intake/Exhaust Ducting (Dynamax only)
*Flying WT. 10 lbs \$169.99

**CENTURY
JET MODELS INC.**

P.O. BOX 111
RANTOUL, ILL 61866
217-893-0707

"Fly for Less"

ZAP UNIVERSITY

COLLEGE OF GLUE KNOWLEDGE



Prof. Sticky VonShtuck

Z.F.P. (Zap Foam Primer)

Same properties as Zip Kicker except that we've added a chemical that protects foam from Zap and other CA's. Not intended for very large surfaces. Ideal for adding leading and trailing edges or wing tips to foam cores. Spritz on Z.F.P. (it's tinted so you can see it)—use only Slo-Zap on the wood—then mate parts and you're finished.



Pacer Tech, Campbell CA

E-Z BEE

(Continued from page 108)

from moving around! If necessary, put some epoxy under them, but put some PVC packing tape on them first so you can pry them out, if need be. Third, put about three layers of PVC packing tape on the wing's trailing edge, running out at least three inches from either side of the fuselage. In any kind of spiralling type of accident, the wing tip hits first and the rubber bands cut several inches into the wing.

And last, go ahead and spring for the second servo (Cox, No. 80412). It brings the pilot more into the control loop and teaches him more. The two-stick controls are a bit confusing, and it might make sense to see about buying the airplane with a Cadet III radio, rather than a II, since the Cadet III has a standard two-axis stick setup on the right side.

Would I recommend the airplane to a beginner? Absolutely! At less than \$150, it puts him into the air and he can keep it there, almost regardless of the number of crashes, assuming he has a basic repair knowledge that includes 5-minute epoxy and glass tape. And it couldn't fly any more easily. In fact, once trimmed, it can be flown with two servos as a rudder-only free flight using the elevator trim only, which produces easy, graceful flights.

If the Bee has any drawbacks, it's the sheer lack of weight: It demands nearly calm days. Also, its lack of penetration means it reacts to everything—thermals from manhole covers, wake turbulence from departing blue jays, *everything!*

Trying to teach myself R/C soon developed into a world-class bummer. In fact, had I not stumbled onto the "moving servo" syndrome, I would have gladly fed the Bee to my Cuisinart and mailed it back to Uravitch in a No. 10 envelope. Now its hard to stay at work, since I want to be out there trying to master my moth-like flying machine. Yes, folks, I have to admit it...I think I'm hooked. But then, you *knew* that was going to happen all along, didn't you?

*Here is the address of the manufacturer featured in this article:

Cox Hobbies, Inc., 1525 Warner Ave., Santa Ana, CA 92705.

JET BLAST

(Continued from page 45)

repeated performance of this sort without airframe failure. The long-awaited F-86 Sabre is here, and it's beautiful. This should be a sure-fire scale winner.

(Continued on page 114)

ZAP UNIVERSITY

COLLEGE OF GLUE KNOWLEDGE



Prof. Sticky VonShtuck

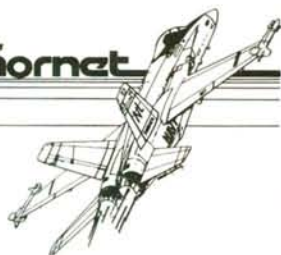


Zap CA

Hottest formula! Thin. Set time: right now! Highest grade chemicals. Wicking action allows assembly prior to gluing. One or two drops are all that's necessary. Very strong. Great for tacking or general construction. Doesn't work well on spruce or oily woods, loves balsa.

Pacer Tech, Campbell CA

hornet



JET FIGHTER SHIRTS

America's best captured in action on the front of t-shirts and sweats.

Bright, full color graphics on a white 50/50 cotton polyester blend heavy t-shirt or warm sweatshirt

Choose from F14 Super Tomcat, F15 Eagle, F16 Fighting Falcon or F/A18 Hornet.

T-shirt \$11.95 Sweatshirt \$19.95

includes all postage

available in all adult sizes, add \$2.50 for XXL specify design and send check or money order to:

PETROSKY DESIGN

3810 Gardner Ave., Cinti., OH 45236

DEALER INQUIRIES INVITED

AERO-STAR

(Continued from page 116)

long enough to do this, so we put a little pushrod through the side of the fuselage to turn the switch on and off.

Upon completion of our model, we checked its center of gravity, and we were lucky, I guess, as we didn't have to add any weight to the ends, because the plane was perfectly balanced.

We installed a reasonably priced second-hand O.S.* Max .25 engine, which was in excellent condition. It started easily and ran perfectly.

This plane's construction manual and its clear drawings were extremely comprehensive. The materials that weren't supplied with the kit were listed in the front, so by taking the manual to your hobby shop and buying the listed materials, you'd have everything needed to complete this airplane.

PERFORMANCE: Nick Zirola Jr. and Rich flew it and were very impressed with the way it flew, but we had to make a minor adjustment to the ailerons and to the nose wheel. Three weeks later, after several hours of training, I can fly it around the field pretty well, but I need lots more instruction before taking off and landing.

(Continued on page 122)

**IF YOU HAVE BEEN
LOOKING FOR THE
LOWEST PRICES IN
R/C EQUIPMENT....**

YOUR SEARCH IS OVER.



FAX: (408) 943-0904

FREE!

136 Page
Catalog

**CALL
TODAY**

Inside Calif.
(800) 822-1688
Outside Calif.
(800) 228-3237

**SHELDON'S
HOBBIES**



SHELDON'S POSI-CURE

2 oz. Cyanoacrylate

GAP FILLING FAST CURE
10-25 SEC. 3-5 SEC.

SALE
\$3.96

SHS702

SALE
\$3.96

SHS700

**ORDERS (800) 228-3237 OUTSIDE CALIF.
ONLY (800) 822-1688 INSIDE CALIF.**

For Information Call: (408) 943-0872

If you are not satisfied with **POSI-CURE** please return the unused portion within 30 days for a full refund - No questions asked!

SHIPPING & HANDLING:

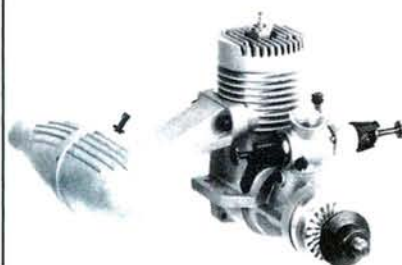
UPS Ground Continental U.S. \$4.95 • UPS Air \$4.95 plus 10% Subtotal
UPS Next Day Air \$14.00 plus \$1.00 per lb. of Shipment Total • U.S. Mail \$4.95 plus 10% Subtotal

HOURS: Pacific Standard Time

Monday & Friday 9:30 am - 7:30 pm • Tuesday, Wednesday &
Saturday: 9:30 am - 5:30 pm Thursday: 9:30 am - 9:00 pm • Sunday: 12 noon - 5:00 pm



Fox 19BB Schneurle



SPECIFICATIONS

BORE	.650
STROKE	.600
DISPLACEMENT	.199
WEIGHT	8 oz.
RPM with 8-4 prop	17,000
FUEL CONSUMPTION	.4 oz./min.

Recent Fox design gives this engine the performance punch that the most exotic racing motors have. But, this engine is docile in nature and has a hot restart capability that is lacking in many A.B.C. motors.

Order#	Style	Cost
12000	Fox 19BB C.L.	\$59.95
22000	Fox 19BB R.C. (w/muffler)	\$79.95

Fox 25



SPECIFICATIONS

BORE	.680
STROKE	.680
DISPLACEMENT	.25
RPM with 9-4 prop	12,000
WEIGHT	6 oz.
FUEL CONSUMPTION	.4 oz./min.

Light, Powerful, and Big

This 25 is as light as most 19's, but packs more power than some 29's. A superb performer, the Fox 25 has been on the market long enough to be thoroughly tried and tested. It's American made and features an MKX-type carburetor.

Order#	Style	Cost
12500	Fox 25 Bushing C.L.	\$49.95
22500	Fox 25 Bushing R.C. (w/muffler)	\$69.95



FOX MANUFACTURING CO.
5305 Towson Avenue
Fort Smith, Arkansas 72901
(501) 646-1656

AERO-STAR

(Continued from page 118)

The kit gave me the option of putting on ailerons, and I decided to do it—no problem! Also, fitting in the motor went smoothly, but to make room for the nose-wheel mount, I had to file off the bottom of the mount.

I covered the rudder and elevators with Top Flite* MonoKote (the recommended material) before attaching them to the fuselage. It seemed much easier to cover them this way, but the instructions suggested that these be covered *after* having been attached to the fuselage. By doing it *my* way, however, I had to remove the MonoKote from places that were to be glued to the fuselage. This was one of the few deviations I made from the kit's instructions.

The kit didn't give any specific instructions on covering, so I had to experiment. The instructions recommended checking with my local hobby dealer, but Rich was closer! Beginning with the underside of the wing, we started at the middle (at the leading edge) and worked towards the wing tip, stretching the material with one hand and ironing it with the other; starting at the leading edge again and pulling toward the trailing edge, we had fewer wrinkles to contend with. When the underside of the wing was finished, we trimmed the edges with a sharp single-edge razor blade (of which we used a bunch), and then ironed them smooth. We then proceeded in the same way with the top of the wing, overlapping the leading and trailing edges just enough to make an inconspicuous seam. On the fuselage, we started at the rear, tacked the MonoKote, and then ironed toward the front, being very careful not to trap any air between the body and the MonoKote. We did have one bubble that bothered us, so we pierced it with an X-Acto knife to let the air out, and after a little more ironing, it had almost disappeared.

The project has been a barrel of fun, and there's a chance "the Nails" are hooked on the hobby! We can't wait to get back to El Paso to show the local modelers what a couple of 70-year-olds can do!

*Here are the addresses of the companies mentioned in this article:

Midwest Products Co., 400 S. Indiana St., Hobart, IN 46342.

Top Flite Models, 2635 Wabash Ave., Chicago, IL 60616.

O.S.; distributed by Great Planes Model Distributors, 1608 Interstate Dr., P.O. box 4021, Champaign, IL 61820. ■

duke's mixture



Not everything we are told is so:

For example: We are often told "It is motor torque, and gyroscopic action, that causes an aircraft to want to turn left when power is applied."

I suspected these forces were insignificant, and that the spiral propwash pushing on the rudder was the overriding force at play — so I devised a little test. Take a North Pacific type rubber model. Assemble, and fly. It will fly in left turn circles. Now cement the stab in with C.A. and then extend the rudder slot from top to bottom. Put the rudder on facing down. It will fly in right turn circles. Replace the rudder with a longer parallel sheet that you can slide up or down, and you will be able to find a position where the top forces and bottom forces are balanced, and the model will fly straight. Conclusion — the "authorities" were just plain wrong.

A second popular belief that just isn't so: "Reducing the crankcase volume of a 2 cycle model airplane motor will improve its power." My observations didn't jibe with this theory, so I devised a test. I fitted all unported cylinder and piston into a rear cover so I could pull the piston in or out while the motor was running, thus varying the crankcase volume. Result: A very slight increase in R.P.M. as the crankcase volume was increased. This I didn't expect, so the test was repeated with several other Fox motors — and a couple of brand X motors. In every case maximum R.P.M. was achieved with somewhat greater case volume than stock. Conclusion: The "authorities" on hopping up a motor were just plain wrong.

A third popular fallacy is that certain imported motors are the best you can buy. Here is a simple test you can run yourself. Buy a Fox 40 Standard and a slightly more costly OS 40 F.P. Check both for ease of starting, power, idle, and throttle response. Need I tell you the results? For a back-up test, buy a Fox 50 and its more expensive imported counterpart. Perform the same tests. Conclusion — The "authorities" that tell you to buy an imported motor are just plain wrong.

Happy Flying,

Duke Fox

Manufacturing Company
5305 Towson Avenue
Fort Smith, AR 72901
Phone (501) 646-1656

LOCTITE® Techniques



LHC-08 30 MINUTE E-POX-E® SYSTEM

1. Mix equal parts.



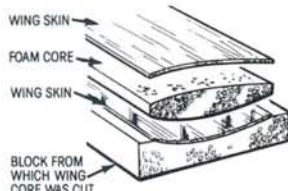
2. Spread epoxy mix on wing skins.



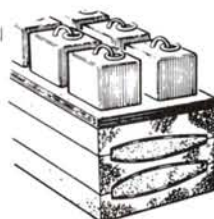
3. Scrape off excess epoxy using notched spreader.



4. Place top and bottom wing skins on wing core. Then place skinned foam core wing in block from which it was cut.



5. Load entire assembly with heavy weights while epoxy cures. Recommend waiting 24 hours before removing wings from stack. **NOTE:** Stack must be on a flat, level surface.



Available at quality hobby shops everywhere.

Loctite and E-POX-E are registered trademarks of Loctite Corporation © 1988

We are Europe's leading manufacturer of pilots and supply fully positional figures to many of the National Scale Champs. We dress these pilots in all known apparel. Accessories include: helmets, goggles, sunglasses, bobble hats, baseball caps, floppy hats, bone domes, oxygen masks, maewests. The popular types are WWI, WWII. Sports one piece suit with stripes (all colours). NATO one piece suit with map pockets (olive green). Glider pilots — turtle neck sweaters, floppy hat, and sunglasses. Standard pilots — tan pants, simulated leather jacket with fur collar, baseball hat, and sunglasses. Our pilots are the lightest ever and come to you painted, dressed, and ready to fly.

1/6 scale (2 oz.) \$20.00 1/4 scale (4 oz.) \$28.00

1/5 scale (3 oz.) \$24.00 1/3 scale (9 oz.) \$32.00

Plus \$5.00 postage and packing Airmail.

"Have fun with our 1/4 scale parachutist, ram chute, rip stop nylon, ready for the two servos. Takes standard flight pack, all makes."

\$90.00 plus \$10.00 postage and packing.

For fast delivery, send or phone your Visa or Mastercharge number.



A.H. DESIGNS

79, Pen-y-Maes Ave.
Rhyl, Clwyd. LL18 4ED
U.K. Tel. 745-53987

SCALE RALLY

(Continued from page 49)

is for refueling, and then it's up again. If you'd like more information, write to John.

For the past three or four Rallies, the flight strip has been the main hard-top runway at Olean Municipal Airport, NY. This year, a fairly strong crosswind made flying and landing difficult, and in compliance with requests made by many fliers, future STARS Scale Rallies will be held on the airport's grass-topped cross-runway.

As usual, a free Chicken Charlie's famous barbecued chicken dinner was offered to each registrant. Though it isn't widely known, those freebie chicken dinners are available because of the sponsorship of *Model Airplane News*, whose willingness to help our event has always been much appreciated.

So another Rally fades into the past. In 1989, STARS will hold its 12th Annual R/C Rally on Saturday and Sunday, July 8 and 9, again at Olean Municipal Airport, NY. We'll return to grass-strip runways, with the option to use the hard-top surface. I hope we'll have more moderate weather, but if it's a choice between wet and cold or hot and humid, we'll take the heat and humidity! See you there?

*You can write to John Pagan at 563 Georgetown, Beaumont, TX 77707.

HELI CHALLENGE

(Continued from page 61)

in fact, produce the effects described here.

To start, get the helicopter light on the skids by moving the left stick forward gradually. The helicopter should look as if it wants to rise off the ground. If the helicopter does lift off, pull the stick back slightly and set the helicopter back on the ground. Try again to just get the helicopter light on the skids. When you detect the lift of the rotor, stop moving the left stick forward. Now gently move the left stick side to side in small increments, and confirm tail-rotor control. Don't over-control the helicopter at this point, as it's possible to crash the machine, even when it's sitting on the ground! Next, gently move the right stick from side to side, and up and down, confirming that the helicopter responds correctly to these control inputs. Practice this exercise to learn the eye/hand experience. As you progress, you'll use the controls automatically, and when you're familiar with the controls, proceed to the next step.

(Continued on page 130)

ZAP UNIVERSITY

COLLEGE OF GLUE KNOWLEDGE



Prof. Sticky VonShtuck



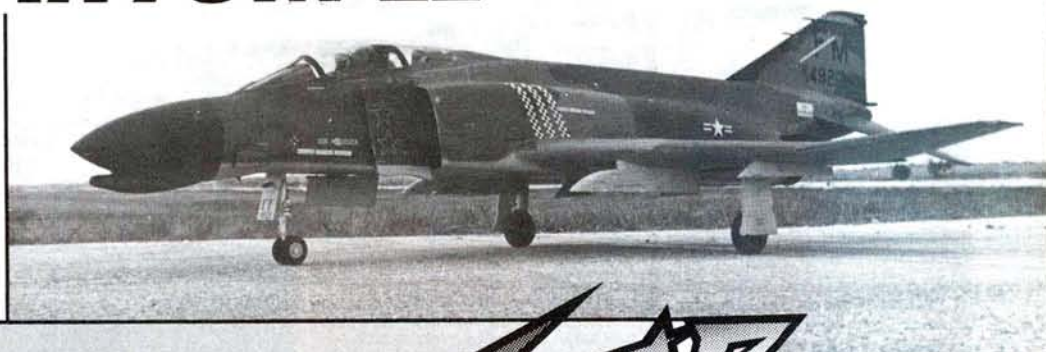
Poly Zap

Glues and repairs Lexan, glues canopies without fogging, and glues space age plastics and nylons. Doesn't fog parts if glue is applied in a film. Kicker may be used but sparingly. Extremely strong. Repairs EZ kits, too.

Pacer Tech, Campbell CA

F-4 PHANTOM II

Wing span: 58"
Fuselage length: 85-5/8"
Wing area: 1185 sq. in.
Wing loading: 38.88 ozs. per sq. ft.
Ready-to-fly weight: 20lbs.
Power: Dynamax Fan System
Channels required: 5-8



STARFIRE

Wing span: 51-1/2"
Fuselage length: 62-3/4"
Wing area: 625 sq. in.
Wing loading: 33.17 ozs. per sq. ft.
Ready-to-fly weight: 9-10 lbs.
Power: Dynamax Fan System
Channels required: 5-6

DYNAMAX

F-4 Complete Kit:

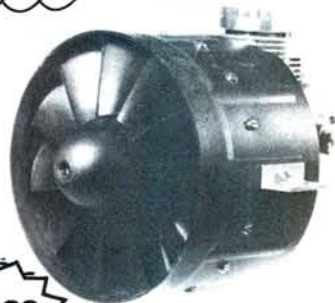
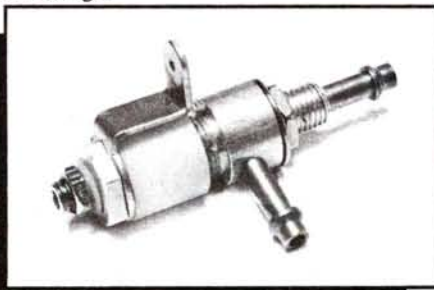
Includes fiberglass fuselage, inlets, tailpipes, foam wing and stabilizer cores, 2 Dynamax fans with O.S. 77 engines with 2 tuned pipes and headers, fuel tanks, Air Command MK-20 landing gear with scale aluminum struts and tires. Canopy with complete cockpit interior, stabilizer mechanism, drogue chute and ejector assy., hand cut bulkheads and all wood necessary to complete the kit. Complete plans and illustrated instruction book with 68 photos.

Starfire Complete Kit:

Includes a fiberglass fuselage, intake duct, inlet leading edges and preformed tailpipe. Also a separately molded top access hatch. Plywood formers and bulkheads are cut along with wing, stabilizer, and vertical fin balsa leading and trailing edge laminations. All flying surfaces are factory balsa sheeted and have landing gear plates installed with lightening holes and spar slots pre-cut. A complete hardware package with necessary parts including wheels, fuel tanks, 1/6 scale jet pilot figure, clear canopy and Thunderbird decal sheet is provided. The Dynamax I Fan System, OS .77 ducted fan engine with tuned pipe and the MK-10 Retractable Gear completes the package. Important to the beginning ducted fan flyer is the most comprehensive step by step instruction manual yet provided in this field of model aviation. Simply stated, the Starfire Kit is complete with everything except the radio, adhesives and covering materials.

Proven Performance

Ducted fan models produced by Jet Model Products along with some of the country's top fan modelers have without question swept the scale competition awards over other manufacturers in the field. Winning the prestigious Scalemasters event in '81, '82 and '84 and the Scale Nationals in '83 and '85 along with top five finishes in nearly every major event in the last eight years is proof enough.



\$80.00

Remote "Air Adjustable" Needle Valve

Jet Model Product's Remote "Air Adjustable" Needle Valve will work in virtually any application where in flight or on the move fuel mixture adjustment is desired. Simple installation requiring an additional channel is necessary. Possible engine displacements range from .25 to 4. Double sealed steel needle and steel seat guarantees a long life and steady operation.

PRICE LIST (Inquire for current shipping costs)

F-4 Kit (complete kit)	\$1,550.00
F-4 Kit (less engines, fans and retracts)	769.00
Starfire II (complete kit)	850.00
Starfire II (less engine, fan and retracts) ...	450.00
Dynamax Fan	80.00
Dynamax Muffled Tuned Pipe (less header) ..	60.00
Remote "Air Adjustable" Needle Valve	24.95



304 Silvertop Raymore, MO 64083
816-331-0356



Imitari has just introduced an exact 1/2-scale replica of the Pratt & Whitney Wasp Jr. engine with a clock placed in the space normally covered by the propeller cone. The Imitari clock, under authorization from United Technologies, also carries the official registered trademark decal of Pratt & Whitney.

Complete kit: **\$195.** plus shipping
Assembled kit: **\$295.** plus shipping
(available in aluminum or black cylinder)

Available in kit form (more than 200 parts) or fully assembled. Imitari also carries baseball caps, T-shirts, belt buckles, decals in several different sizes, lapel pins, coffee mugs, cigarette lighters, pocket knives and even a .999 full troy ounce silver medallion, all bearing the Pratt & Whitney emblem.

Free Brochure Available

For more information on these and other products, contact

Imitari:
P.O. Box 985
Athol, ID 83801
(208) 683-3187

QUADRA

"THE STANDARD"

STRONGER THAN EVER!

Now part of Plastic Engine Technology Corporation (PETCO) we are pursuing our traditional goals of **Performance, Quality & Good Value!**

Production is concentrated on our updated Q35S, Q40's and Q50SS in quantities to meet the demand.
Your Loyalty & Patience Is Appreciated.

Quadra up-date kits are reasonably priced to give any veteran Q35 or Q50
A Powerful New Lease On Life!

Talk to your dealer or write direct for the "Quadra Update".

PETCO QUADRA

AERO ENGINES P.O. Box 189,
Agincourt, Ontario, Canada M1S 3B6
Tel: 416-754-0396 Fax: 416-754-4863

HELI CHALLENGE

(Continued from page 124)

The Six-Inch Hop

This is what I call the next exercise. With the helicopter on the ground, its nose facing into the wind, gradually lift it six inches off the ground and hold it there just a moment before starting to gradually bring it down. The key here is to achieve sufficient control so that the helicopter gently breaks ground, rises up six inches and then lands as gently as it lifted off. As simple as this sounds, you'll be surprised at the difficulties you encounter. Trying to keep the rotor head level and controlling the machine off the ground and setting it back down again can be very confusing! Keep repeating this process until you're confident, gradually increasing the height until you're competently performing the exercise to about two feet. *Don't* attempt to hold the helicopter in a steady hover, as you're not yet ready for this step, and you may find that the helicopter is flying *you* instead of the other way around!

When you've mastered the six-inch hop, it's time to try hopping the helicopter in some intended direction. Start by hopping the machine six inches forward, then left, right, and backwards. Try some diagonal hops, and get a feel for how the machine handles. Gradually increase the length of the hops until the helicopter hops a few feet. Don't overdo it; remember that this requires patience and discipline. Practice these exercises in the suggested order until you've mastered them. By doing this, you're building a foundation for more complex maneuvers, and training your reflexes so that you can move on to more advanced steps. Once again, don't attempt to hold the helicopter in a stationary hover; this will come later. I'm trying to take you through the learning process as quickly as possible, so you should avoid having to spend time repairing a machine that was broken while attempting something you weren't quite ready for.

That's it for now; keep practicing. Next month I'll continue my formula for flight-training success. ■

DURAPLANE

(Continued from page 68)

bolted this sub-assembly to the rugged plywood fire wall supplied in the kit. The fire wall installation is novel in that no adhesives are used; it simply uses four sheet-metal screws, one through each of

(Continued on page 134)

CLEVELAND'S GIANTS!

MANY NEW! FOR R/C-BUFFS

Designed As Basic, Master Flying Models Following Built-Up Prototype Practice of Wood and Fabric. If Replica Builders Use Them—Shouldn't You?

Many New! Historically Presented!

- | | |
|------------------------------|------------------------------|
| 87" Curt JN4 Jenny \$37. | 81" DH Mosquito B'b \$42. |
| 84 Fokker D.7 Fr. \$39. | 108 DH Mosqu. Bomb \$55. |
| 70 Bayles Gee-Bee \$32. | 98 Stear PT17 Kaydet \$56. |
| 60 Howard Race \$32. | 99 N. Blk Widow P61 \$69. |
| 89 Supermarine S.6B \$24. | 71 Doug. DC-3 (C47) \$35. |
| 89 Supermarine S.6B \$35. | 95 Doug. DC-3 (C47) \$35. |
| 63 Curt. Hawk P-6E \$42. | 86 Hawks Texaco 13 \$32. |
| 94 Curt. Hawk P-4E \$44. | 64 Stout Sky-Car \$18. |
| 74 Doolittle G-B 11 \$48. | 72 Car. 02U1/4 L&S \$46. |
| 95 Monocoupe Sport \$36. | 108 Car. 02U1/4 L&S \$56. |
| 80 Hall Spr Bulldog \$43. | 60 Douglas M-2 Mail \$24. |
| 107 Aerona C-3 Spt \$35. | 68 Bristol Bulldog Fr. \$30. |
| 62 Howard Race lke \$45. | 59 Brwn Race Mst. A. \$54. |
| 78 Turner's W-W Rac \$35. | 107 Grum Bearcat F8F \$54. |
| 63 Cur Gash'k F11C \$42. | 69 Lindbergs NX-211 \$28. |
| 94 Cur Gash'k F11C \$54. | 91 Lindbergs NX-211 \$39. |
| 66 DeHav Comet Rac \$24. | 96 Wr. NW-1 Nav Rac \$48. |
| 62 How. Mr. Mulligan \$35. | 74 C. Helldivr S8C-4 \$55. |
| 94 How. Mr. Mulligan \$45. | 108 Fairch. PT-19 Tr. \$59. |
| 63 Boeing P-26A Fr. \$36. | 60 Waco Taper-Wing \$36. |
| 84 Boeing P-26A Fr. \$48. | 90 Waco Taper-Wing \$48. |
| 69 Waco C-6 Cabin \$36. | 75 West'd Lysander \$32. |
| 64 Beech C17-B Stag \$38. | 100 West'd Lysander \$49. |
| 96 Beech C17-B Stag \$49. | 57 Ford Trimtr 4-AT \$36. |
| 55 Lock. 11 Electro \$30. | 76 Ford Trimtr 4-AT \$48. |
| 82 Lock. 11 Electro \$40. | 114 Ford Trimtr 4-AT \$65. |
| 62 Stinson T/W SR7 \$18. | 96 Bellanca Aircrul. \$40. |
| 81 Stinson T/W SR7 \$26. | 93 Loening C-2 Amph. \$69. |
| 122 Stinson T/W SR7 \$38. | 58 Grum. J2-F Duck \$31. |
| 59 Bristol Fr. F2-B \$20. | 78 Grum. J2-F Duck \$56. |
| 118 Bristol Fr. F2B \$45. | 124 Lock Air Express \$48. |
| 74 Turner's "Pesco" \$45. | 62 Lock Air Express \$24. |
| 56 Cur Warhk P-40 \$24. | 83 Lock Air Express \$36. |
| 60 Vogt Corsair F4U \$35. | 77 W-Wms 121 Redl. \$48. |
| 80 Vogt Corsair F4U \$69. | 63 C. Seahawk F7C-1 \$45. |
| 78 Lock Light'n'g P-38 \$38. | 94 C. Seahawk F7C-1 \$57. |
| 56 Rep. Sea-Bee Am. \$24. | 108 Sikor S-38 Amph. \$49. |
| 74 Rep. Sea-Bee Am. \$39. | 60 Boeing 100 Sport \$36. |
| 70 Piper J-3 Cub \$29. | 90 Boeing 100 Sport \$49. |
| 106 Piper J-3 Cub \$39. | 72 Northrop Gamma \$48. |
| 98 Lock Hudson Bmb. \$38. | 96 Northrop Gamma \$75. |
| 63 Grum F6F Hellcat \$28. | 90 Stins "A" Low 3/M \$56. |
| 77 Boeing B-17G Fort \$35. | 60 Stins "A" Low 3/M \$42. |
| 103 Bee. B-17G Fort \$55. | 120 Stins "A" Low 3/M \$82. |
| 68 West Whirlwind \$32. | 78 Consol. Cat. PBV5A \$42. |
| 68 N. Amer. Navion \$39. | 104 Con. Cat. PBV5A \$56. |
| 68 B. Bonanza V-Tail \$39. | 65 M. China Clipper \$65. |
| 77 Luscombe Sedan \$25. | 97 M. China Clipper \$75. |
| 72 N.A. B-25 Bomber \$49. | 62 Curtiss NC-4 \$59. |
| 65 M. Marauder B-26 \$49. | 94 Curtiss NC-4 \$69. |

— AFTER PRICE INDICATOR QUARTER SIZE GIANT PLAN Over 1200 Others, 6" - 73"; All Parts Incl. 50c Up. Add 10% to all orders for shipping & ins., etc., to U.S.A., Can. & Mex. Elsewhere its 15% (25% if by air). Pictorial catalog \$2.00 (includes Price List). Price list section alone \$1.00. If by air, foreign, add \$1.00.

CLEVELAND MODEL & SUPPLY CO.
EDWARD T. PACKARD—AVIATION'S BEST FRIEND—SINCE 1919!
10307 A. DETROIT AVE. CLEVELAND, OHIO 44102
Phone Service—(216) 961-3600

F-100 SUPERSABER

optional drop tanks and dive brake

67" L x 54" WS
4 - 9 Channel
28 oz. Wing Load
832 sq. in. area

\$325.00
1/8.6 Scale



NEW

F-20 TIGERSHARK

70" L x 48" WS
5 Channel
32 oz. Wing Load
712 sq. in. area

\$289.00
1/8 Scale



SAAB AJ37 VIGGEN

optional canard flaps

64" L x 45" WS
5 - 6 Channel
26 oz. Wing Load
895 sq. in. area

\$329.00
1/9.5 Scale



ST. CROIX CLASSIC

VIDEO \$19.95

\$2.00 Kit Info & Dealer List

Long-EZ



CANARDS!

1/4 SCL Quickie **\$74.95**

4 CH • .35-.45 ENG.

1/4 SCL **\$99.95**

4 - 5 CH • .40 ENG.

Canard Trainer **\$44.95**

4 CH • .35-.45 ENG.

Made in USA by Modelers, for Modelers
U.S. and Foreign Dealers/Distributors Wanted

Cressline Model Products, Ltd.

W239 N1690 BUSSE RD
WAUKESHA, WI 53188
(414) 548-3792

MODEL AIRPLANE NEWS HOBBY SHOP DIRECTORY

Retailers: Make your business grow with new traffic! Now you can advertise your hobby shop in the *Model Airplane News Hobby Shop Directory*. The listing will be published monthly and will be listed according to city and state. You will have 3 to 4 lines, approximately 20 words, in which to deliver your sales message, plus space for your store's name, address, and telephone number.

HOBBY SHOPS: Act now and get first ad free!

Directory space is sold on a yearly basis with a choice of three payment plans: 1. \$179 per year, payable in advance; 2. \$97 for six months, payable in advance; or 3. \$17.50 per month to be billed monthly. Space reservations must be received by the 20th of the third month preceding publication (for example, January 15th for the April issue).

CONNECTICUT—Bristol

15 minutes from Hartford. Complete stock of R/C boats, cars, airplanes, and helicopters. Also, two- and four-cycle engines. All major items discounted. Hours: Mon., Tue., Wed., 10-7; Thu., Fri., 10-8; Sat., 10-5:30; Sun. Nov-Jan. 1-4.

BRISTOL HOBBY CENTER

641 Farmington Ave., Rte. 6 583-7273

CONNECTICUT—Norwalk

Connecticut's leading R/C shop, 15 years experience flying and selling radio control. Over 3,500 different items in stock. Custom ordering for hard-to-find parts.

AL'S R/C SUPPLIES

54 Chestnut Hill Rd. 846-9090

FLORIDA—Miami

R/C airplanes, cars, boats, and helicopters. Mon. thru Sat. 9-6.

ORANGE BLOSSOM HOBBIES

1975 NW 36th St. 633-2521

GEORGIA—College Park, Atlanta

R/C Helicopters, X-Cell service center, Bob Violett ducted fans. Built aircraft on display. Two min. from Hartsfield Int. Airport., Mon-Sat. 10:00-8:00. Call Jim Himes.

IN AIR HOBBIES

2730 Sullivan Rd. 404-763-2745

ILLINOIS—Chicago

Chicago's largest hobby shop. R/C planes, helicopters, boats, and cars. R/C Repairs, installations, and custom building. Mon-Fri. 10-9; Sat. 9-6; Sun. 11-4.

STANTON HOBBY SHOP, INC.

4734 Milwaukee Ave. 283-6446

NEW JERSEY—Mercerville

Complete line of planes, Robbe, Sig, Kraft, Great Planes. Large R/C selection plus trainers, boats, and all other hobby needs. Open 7 days.

IRON HORSE HOBBIES

116 Flock Rd. 586-2282

NEW JERSEY—Red Bank

Full-line hobby shop. Ask us, we will compete with mail-order prices. Mon.-Wed. 10-6, Thr. Fri. 10-8, Sat. 10-5, Sun. 12-4.

HOBBYMASTERS

62 White St. 842-6020

NEW YORK—Elmsford

A complete R/C hobby shop, carrying a full line of supplies and parts for R/C airplanes, cars, and boats with 40 years R/C experience. Tue., Wed., Fri. 11-7, Thurs. 11-9, Sat. 10-6.

ANDY'S HOBBY SHOP, INC.

36 E. Main St. 592-5176

OHIO—Findlay

Findlay's local R/C dealer, planes—cars—boats. We specialize in R/C, large selection of kits, accessories, and parts. We are authorized Sig and Dremel dealers. Also sell plastic kits and model rockets. Tue. & Thu. 3-9, Mon., Wed., Fri., & Sat. 10-9.

JINX MODEL SUPPLIES

721 Rockwell Ave. 422-5589

OKLAHOMA—Tulsa

R/C Specialists, planes, helicopters, cars and boats. We also have kites, boomerangs and plastics. Experienced personnel to answer all your questions. AE, Visa, MC. Hours: Mon.-Sat. 10-6, Thurs. 10-8.

WINGS 'N THINGS HOBBY SUPPLY, INC.

5153 S. Peoria Ave. 745-0034

TEXAS—Houston

R/C airplane specialists, R/C cars, boats, helicopters. Plastic models, rockets, trains, HO & N. "Toys for Big Boys." Mon.-Fri. 11-7, Sat. 10-6.

LARRY'S HOBBIES

156-F FM 1960 E. 443-7373

LATIN AMERICA

COSTA RICA—San Jose

Complete line of R/C airplanes, cars, boats, and helicopters. Parts and professional expert service and advice. Julio Pastura, President. Weekdays 4-10 p.m.

EL HOBBY SHOP

Centro Commercial, San Jose 2000
Apartado 529, Centro Colon 32-26-81

Send sales message and payment to **Model Airplane News Hobby Shop Directory**, 251 Danbury Rd., Wilton, CT 06897.

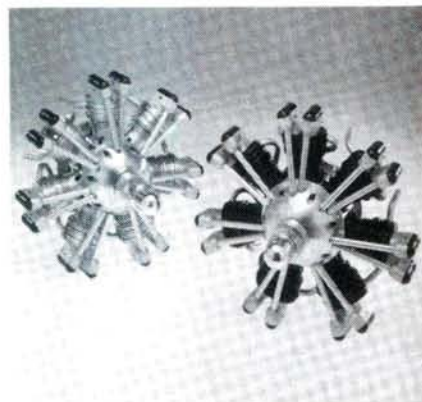
For further details or information on our special introductory offer, call toll-free 1-800-243-6685 and ask for Katherine Tolliver.

DURAPLANE

(Continued from page 130)

the PVC "fuselage" tubes to hold it in place. Rather than "complicating" the fuel-tank installation by putting it inside the fuselage, Duracraft specifies that you should mount it externally, on the left side of the fuselage, and this makes a lot of sense: The fuel supply is visible, the feed lines are short and go directly to the engine, and, in the likely event of a "hard arrival," it will pop off instead of rupturing, as is frequently the case with internally mounted tanks. I made two music-wire "hooks," old profile U-Control type, to secure the 4-ounce Sullivan tank with rubber bands. Duracraft recommends just lashing it to the fuselage with a couple of No. 64 rubber bands around the tank, but we can't *entirely* forget aesthetics, can we?

Next is the wing, which, as I already mentioned, is molded foam. Since only three channels will be used in our Duraplane, no modification was made to incorporate ailerons. After lightly sanding the wing to remove all the molding marks, using epoxy, I embedded short lengths of 3/16-inch dowel in the leading edge at the root. These will prevent the wing hold-down rubber bands from cutting into the foam. Similarly, strips of 1/32-inch ply were added to the trailing edge on the upper and lower surfaces. I covered the wing with Carl Goldberg Models* UltraCote, which is one of the many iron-on films available for this purpose. This was the first time that I've had the opportunity to use it, and I chose it partly because I'd been told that it has a very broad application-temperature range: low enough to use directly on foam, without overheating to the point of creating an airborne pigskin. It worked



Technopower's

NEW BIG BORE 7

- Cast Iron Piston Rings
- 14x6—16x8 Prop Range
- Extra Heavy Crank Shaft Supported By Ball Bearings Fore and Aft
- Phosphor Bronze Valve Guide
- Master Rod Runs on Needle Bearings
- Rocker Boxes are Investment Cast—Balance of Engine is Bar Stock
- Hardened and Ground Steel Cams
- Hardened and Centerless Ground Valves
- Weight: 30½ oz

- 7 Cylinder
- 4 Cycle
- Overhead Valves
- Glow Ignition
- Displacement 2.0 cu in.
- Red Line rpm 9000
- Flying rpm 8500
- 6½-in. Diameter
- Hard Chrome Bore

TECHNOPOWER II INC.



Send \$3 for catalog.

610 North Street • Chagrin Falls, OH 44022 • 216-564-9787

extremely well, going on smoothly and easily while bonding tenaciously, even at low heat. I also used it to cover the tail group (which is balsa); I turned up the iron and the material worked just as well as it did on the foam. I was very impressed with the ease of handling and can strongly recommend it for your first attempt at film covering.

Before covering, I applied strips of 1½-inch nylon strapping tape to both the upper and lower surfaces of the wing. This adds tremendously to the flex resistance of the wing and the crash resiliency of the airplane. Don't overlook this important step, which is clearly pointed out in the instructions.

Next, after bonding the ¼-inch ply strips to the inside of the fuselage, the landing gear was installed. It's held in place with sheet-metal screws that hold up to reasonable abuse, but shear under hard impact—with any luck, *before* tearing up the lower fuselage. Duracraft recommends leaving the gear off for a while if you're a beginner, but I disagree. I added a tail wheel for the same reason: You should get used to ground handling as well as flying right away. Many beginners may even leave the wing off and taxi around for practice *before* flying, simply to get an understanding of control-response differences when the airplane is coming towards you or going away from you. Given the choice, I say go with the gear.

After you bolt the aluminum channel to the PVC tube, you're in the home stretch. I added a couple of ¼-square-inch spruce strips to the lower wing center section. These are positioned to form guides to keep the wing centered and prevent it from shifting from side to side.

Install your receiver and battery pack, hook up the controls and check the center of gravity (the balance point, actually), which should be no further aft than 2 inches from the leading edge of the wing. Don't try to fly a tail-heavy airplane! There's a whole section in the instructions on flying the Duraplane; it's pretty thorough and will be helpful. Here's what we found.

PERFORMANCE: Rather than seeing whether the Duraplane lived up to its name first, we decided to see how well it flew and whether or not a beginner could feel comfortable with it; *then* we'd test its durability. Test-hop day had the Zirolis (Nick and Nick Jr.), and a bunch of other members of our club on hand. "You never can tell what Uravitch will show up with." After filling the tank, we started the Magnum, which showed no reluctance to

(Continued on page 139)

Patent Pending

St. #043
.475" str.—\$6.95

St. #044
.580" str.—\$7.95
If not available write direct.
add \$1.00 (\$2.00 outside US)



"LINE DRIVE" converts rotary servo output to linear output without adding BACKLASH or FRICTION. "LINE DRIVE" is easily mounted on your servo arm with two screws. Two versions supply .475" or .580" total travel for 90 degrees of servo rotation. Linear output eliminates lateral motion and reduced push rod stroke at servo extremes resulting in reduced sensitivity at neutral for easier flight trim. There are no gears to wear out or break and the smooth motion is a sight to behold.

MODEL PRODUCTS CORP.

P.O. BOX 100 ALLAMUCHY, NEW JERSEY 07820

WOW! AN AUTOGIRO!



NEW!

1
48
SCALE



Something different! Pitcairn Autogiros were operated by commercial firms and the U.S. Navy during aviation's Golden Age. Kit features: Injection-molded plastic parts • Monofilament rigging • Comprehensive instructions • Civil and military decal markings
SEND \$3 FOR COMPLETE COLOR CATALOG • DEPT. MAN
181 PAWNEE STREET, SAN MARCOS, CA 92069

ZAP UNIVERSITY

COLLEGE OF GLUE KNOWLEDGE



Zap A Gap CA+

A bit thicker. Set time: up to 5 seconds. Workhorse of the line. Glues most dissimilar materials...balsa, plywood, hardwoods, plastics, etc. Bonds through oil and grease. Excellent for field repairs. #1 modeler's choice.

Prof. Sticky VonShtuck

Pacer Tech, Campbell CA

DURAPLANE

(Continued from page 135)

get the show on the road. All the controls were checked at various power settings to make sure the radio (an old-series World Engines Expert converted to a new frequency) was still playing properly. This was followed by the mandatory range check, which further verified proper radio operation. This done, we shut the Magnum down, topped off the tank and prepared to launch. For the first flight we ran the engine a bit rich and set the airplane in position on the runway. After taxiing around a bit, (I told you the tail wheel would come in handy), I aimed it down the center line and gradually applied power. Unlike many "tail draggers," the Duraplane took almost no right-rudder correction for torque, probably because the angle at which the airplane sits on the ground is almost that of the average tricycle-gear airplane. After a takeoff roll of about 75 feet, the Duraplane lifted off with just a touch of up-elevator. A little elevator trim had the model flying "hands-off" with no problem. The control set as specified in the instruction book might initially be a little too snappy for the beginner, as the airplane was probably a bit more responsive than I think it needs to be.

Everyone who wanted to was given a chance to fly the airplane, and the consensus was that it was easy to fly, perhaps a little faster than ideal for *ab initio* training, but, with help, it would provide the newcomer with a simple flight trainer. One comment was made that bears some consideration: Because it's relatively small, it must be flown closer to the flier to avoid the orientation problems that most beginners experience. This isn't peculiar to the Duraplane, but is typical of the smaller trainers.

OK, it flies pretty well, but how about getting back to that video tape to see why it was named Duraplane? Let me begin by saying that, regardless of how long you've been in the sport, or how many airplanes you possess, it's very difficult to *intentionally* crash an airplane! There's just something about doing it on purpose that goes against your better judgment. So, how do we proceed? Easy: We make a competition out of it!

Our flying field is bordered on one side by a corn field, and the corn was ready for harvest when we were out flying. Big, tall stalks of corn—know what I'm talkin' about, Vern? Enter the Zirol Ag Fliers, crop dusters extraordinaire! The Duraplane became our mount, the corn the

(Continued on page 141)

KRESS JETS, INC.

4308 ULSTER LANDING ROAD
SAUGERTIES, NY 12477
914-336-8149

DUCTED FANS

FAN	LIST	THRUST	DIAMETER
RK-720 MK II	\$ 84.50	3-4 LB.	3.40 IN.
RK-740 MK III	\$ 94.50	6-7 LB.	4.13 IN.
BOSS 602 PRO	\$119.50	10-12 LB.	5.33 IN.



FULL LINE OF
LOW COST
FANS, ENGINES
& ACCESSORIES

Dealer Inquiries Invited

Write or Call for Illustrated Catalog \$2.00
performance, specs, prices

INSTANT TEMPLATES

See Temp is a special soft mix of vinyl, calendered on both sides. It is .015-inch thick for rigidity and sized 21 1/2 x 51 1/2", large enough for most projects, or tape two pieces together. It will not crack or shatter. A frosty finish prevents glare or distortion.

It's easy and quick. Lay See Temp over plan, score with a modeling knife, and break on score line. Templates are permanent and can be labeled for filing.

It's see-through.

You get it right the first time!

SEE	1 sh.—\$ 5.50 ppd.
TEMP.	2 sh.—\$10.00 ppd.
P.O. BOX 105	3 sh.—\$15.00 ppd.
SUSSEX, WI. 53089	4 sh.—\$20.00 ppd.
	5 sh.—\$22.00 ppd.

HURRICANE



Giant Scale Hawker Hurricane

Wingspan.....	92 inches
Wing Area.....	1420 square inches
Overall Length.....	74.25 inches

Plans, canopy, cowl, belly scoop, and aluminum spinner are available—please write for more information.



Available from:
Roy Vaillancourt
18 Oakdale Ave., Farmingville, NY 11738

SUNSHINE HOBBY READY TO FLY!

Call: 1-800-45-TO FLY

*ACCESSORIES INCLUDED

PIPER CHEROKEE-40	\$129.99
PIPER CHEROKEE-25	108.99
FOKKER E111-40	119.99
FANCY STICK-40	114.99
FANCY STICK-25	69.99
CESSNA 172-20	108.99
CONDOR-40L	119.99
TERCEL-45	121.99

(ENGINE NOT INCLUDED)

PIONEER I (CAR) \$60.00

(ENGINE INCLUDED)

17221 South Western Avenue
Gardena, California 90247

CONTACT US FOR THIS MONTH'S SPECIAL



Learn more about the exciting world of offshore racers, hydros, tunnel hulls, deep vees, ships, sailboats and sport boats in all scales of gas and electric!

For a sample copy of the leading R/C boat magazine, send \$1 (\$2.95 value), postage included, to:

Radio Control Boat Modeler Special Offer
Air Age Mail-Order Services
251 Danbury Road
Wilton, CT 06897



"Matched Performance System" for TOP PERFORMANCE

K&B ENGINES

Airplane Marine

K&B FUELS K&B GLOW PLUGS
9 Blends 4 Choices

"Matched Finish System" for BEST APPEARANCE

K&B FIBERGLASS CLOTH K&B Micro-Balloons FILLER
K&B SUPER POXY RESIN K&B SUPER POXY THINNER
K&B SUPER POXY PRIMER K&B SUPER POXY PAINT
K&B MIXING CUPS



K&B MANUFACTURING

12152 Woodruff Avenue
Downey, California 90241

JET ENGINES

- Miniature turbines • Military surplus
- Pulse jets • Ramjets • Kits
- Plans • Pen Pals

DOYLEJETS
\$195

NEWSLETTER \$12.00
CATALOG \$5.00


DOYLEJET

4015 San Jacinto #404A
Houston, TX 77004

Radio Control Car Action Special Offer
Air Age Mail-Order Services
251 Danbury Road
Wilton, CT 06897



TELEFLITE
CORPORATION



**BUILD
YOUR OWN
ROCKET
MOTORS!**
WE CAN SHOW YOU HOW!

- **40 POUNDS THRUST!**
- **50¢ EACH!**

- With a rock tumbler and some simple hand tools, we'll show you how to build **YOUR OWN** rocket engines in your own garage or workshop for 1/5 to 1/10 the cost of the commercially marketed motors.
- **INTERESTED?** Just send us \$2.00 and we'll mail you our brochure along with a **WORKING SAMPLE** of an electric igniter that **YOU CAN MAKE YOURSELF** from materials you'll find around the house.

TELL YOUR FRIENDS ABOUT US! We're the **DO IT YOURSELF ROCKET** people.

Write to: The Teleflite Corporation
Department MN12
11620 Kitching Street
Moreno Valley, CA 92387-9978

Club of the Month

Saginaw Valley Radio Control Club

The Saginaw Valley Radio Control Club is the *Model Airplane News* "Club of the Month" for December 1988.

The SVRCC hails from Saginaw, MI (undoubtedly the home of the Saginaw automobile transmission). This club of roughly 70 loyal fliers shows a great deal of interest and dedication to ensure the longevity of their club and of model airplane flying. The SVRCC has instituted a flight training program: Under the guidance of a seasoned flier, new members are taught the basics of R/C flying. As we all know, it can be very disappointing to spend a good sum of money and a great deal of time on your first airplane, only to see it planted in the ground at high velocity. By taking advantage of the infinite wisdom of an "old pro," first-time fliers will be more confident about flying, and they'll find our hobby much more pleasant if they're able to land their planes in one piece! Score one for the SVRCC!

If variety is the spice of life, members of the SVRCC certainly have enough diversity to keep their hobby alive and kicking. Along with its standard field and runway, this club has a myriad of events that appeal to a wide range of interests, including a cross-country rally, a sea-plane fly-in and a large air show to show the public the thrills (and spills!) of R/C flying. Aside from the club's own activities, SVRCC members attend a number of neighboring club events, including helicopter fun flies, pattern contests and soaring meets.

It is with great pleasure that the staff of *Model Airplane News* has chosen to award the Saginaw Valley Radio Control Club two, free, one-year subscriptions. The subscriptions may be given by them to a couple of the club's outstanding members. ■

Each month **Model Airplane News** will select the club newsletter that best shows the club's activities and energies directed toward the furtherance of the hobby. The award is not based on size or quality of the newsletter, and can be about any aspect of the hobby (F/F, C/L, R/C, boating, cars, etc.). **Model Airplane News** will award two free one-year subscriptions to be given by the club to outstanding junior members. So send your newsletter to **Model Airplane News**, Club of the Month Contest, 251 Danbury Rd., Wilton, CT 06897.

[illegible]

NEED THE REAL THING?

U.S. MILITARY & CIVILIAN

FLIGHT CLOTHING

- EMBLEMS & INSIGNIA
- JACKETS
- FLYING SUITS
- HELMETS
- PARACHUTES
- LEATHER JACKETS
- FULL LINE OF NOMEX APPAREL

- COMMUNICATIONS
- SURVIVAL GEAR
- ACCESSORIES
- GLOVES
- G-SUITS

ALL NEW MANUFACTURE
CURRENT MILITARY ISSUE

WATKINS AVIATION, INC.

15770 MIDWAY RD. HANGAR #6
ADDISON, TX 75244
214/934-0033



FREE ILLUSTRATED CATALOG
To U.S. Zip Codes

FINALLY !! The Ultimate BOARD
Designed & engineered for WARP FREE
construction from
HIGH-TECH MATERIAL



- Portable and Lightweight
- Conveniently Stored
- Large: 20" x 78"
- Endgrain balsa block pin surface 3/4" deep
- Unaffected by temperature and humidity

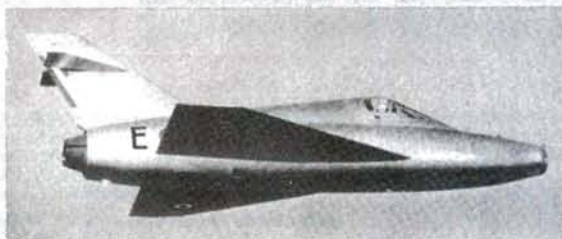
ZIEC
3700 BOULDER
PORT ARTHUR, TX 77640
409-982-8777

CASH PRICE \$135.00
Can UPS
VSA & MC

NAME THE PLANE CONTEST

Can you identify this aircraft?

If so, send your answer to **Model Airplane News**, Name the Plane Contest (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.



Congratulations to Marc Karpowich of Logan, UT, for correctly identifying the Meteor s.p.a. FL .54 sea-plane in our October issue. Only three readers correctly identified the Meteor; most others thought it was some type of Piper.

The FL .54 was a three-place, general-purpose airplane used for Ag work, glider towing and, as we showed, seaplane flying. Powerplant was either an 85 or 95hp Continental, which gave a max speed of 125mph.

The winner will be drawn four weeks following publication from correct answers received by postcard delivered by U.S. Mail and will receive a free one-year subscription to **Model**



Of conventional construction (fabric over wood or tube), the Meteor spanned 32 feet and weighed 794 pounds empty.

Airplane News. If already a subscriber, the winner will receive a free one-year extension of his subscription.

DURAPLANE

(Continued from page 139)

mission, and durability the test. We flew alternating passes, lower and lower, threading our way through the varying heights of the corn stalks. Nick Sr. was doing really well, and even had the Duraplane go out of sight behind some corn, but just how long could this go on? Not long! Bang, then silence, then the appearance of a Duraplane glider, inverted, sideways and decidedly out of control, emerging from this season's crop. In an instant, the Duraplane smacked down on the runway, the engine and airframe headed in two different directions, both still airborne. Boy, was this a

test! The wing was askew and half of the laminated-ply fire wall remained in the fuselage; the other half resided with the engine and mount assembly. We removed the piece from the fuselage, re-bonded it to the engine half with Pacer's* Zap-A-Gap, re-installed it and we were back in business. Although the servos remained in place, they'd shifted a little as evidenced by the surface deflection of the elevator and rudder. By re-positioning the servos to provide a control-surface "neutral," we were assured that they had been returned to their original position.

We flew the Duraplane another three flights that day, but in a decidedly less abusive manner. I now have 28 flights on the airplane and it still flies well. With not

much to break, it could go on forever, especially since Duracraft has all those spare parts available! I see a lot of ads for the kit and there will probably be a lot of them purchased; many by rank beginners, others by more experienced fliers who want something to "just knock around with." It seems that the Duraplane just might find a bigger audience than originally intended. Based on its apparent survivability, you may just have one of them in your hangar *forever!*

**Here are the addresses of the manufacturers mentioned in this article:*

Duracraft, 1007 Orchard Grove Dr., Royal Oak, MI 48067.

World Engines, 8960 Rossash Ave., Cincinnati, OH 45236.

(Continued on page 145)

THERMAL CHARGER

If what you are looking for in an electric sailplane is, good looks, easy to build, fun to fly, and great performance, Thermal Charger is the one for you.



PRECISION
PRODUCTS INC. (714) 592-5144
510 E. Arrow Highway, San Dimas, CA 91773



Classified

WANTED: RTF U-Control planes from Cox, WenMac, Comet, Aurora, Testors, etc., complete or pieces, buy or trade. John Fietze, P.O. Box 593, Lynbrook, NY 11563.

WANTED: Model airplane engines and model race cars made before 1950. Jim Clem, 1201 E. 10, P.O. Box 524, Sand Springs, OK 74063; (918) 245-3649.

SCALE DOCUMENTATION: Plan Enlarging. Photo packs, 3-view drawings for 1,600 aircraft. Super-scale R/C plans for Giant, Sport. 60-page catalog \$4. Scale Plans and Photo Service, 3209 Madison Ave., Greensboro, NC 27403; (919) 292-5239.

CUSTOM EMBROIDERED PATCHES. Your design made any size, shape, colors. Five patch minimum. Free random sample and brochure. Hein Specialties. 4202K North Drake, Chicago, IL 60618-1113.

BEGINNERS, discouraged by too-fast "trainers"? Send \$1 and two stamps for no-holds-barred evaluation of 30 popular R/C trainers rated for their ease-of-flying. Jim Waterman, 3818 Deerfield Dr., San Antonio, TX 78218.

PLANS ENLARGED. Large Scale Specialists. Model Drafting Software, PC Model Software. Free catalog. Concept, P.O. Box 669E, Poway, CA 92064; (619) 486-2464.

WANTED: Berkeley and Cleveland kits or related items: parts, plans, boxes, brochures, books, ads, radio equipment, accessories, etc. Gordon Blume, 4649-191st Ave. S.E., Issaquah, WA 98027.

ANTIQUE IGNITION ENGINE PARTS: Champion—Stitt—NGK Spark Plugs, Coils, etc. Timers, Points, Tanks, Needle Valves for most older engines. Catalog of "Quality" Reproduction Parts—\$4 U.S.—\$7 International (Air Mail). MICRO MODEL ENGINEERING, 1301 West Lafayette, Sturgis, MI 49091.

GIANT SCALE PLANS by Hostetler. We fly what we draw. Send SASE to Wendell Hostetler's Plans, 1041 B Heatherwood, Orrville, OH 44667.

SCALE MODELERS/AVIATION BUFFS/COLLECTORS Dimensioned scale drawings by William Wylam; all soft-bound in the "Scale Models" book. Features Grumman classics F2F and F3F; Seversky P-35; Waco "C" and "D" models; Wedell Williams Racer, plus other famous aircraft. Even includes detailed drawings of P&W Twin Wasp and Wright Whirlwind engines. Out-of-print collector's book—very limited quantities. Send \$7.95, add \$1.75 S&H; Foreign Surface Mail, add \$2.75; Foreign Airmail, \$5.50. Payment must be in U.S. funds drawn on a U.S. bank or by an International Money Order. Air Age Publishing, Inc., 251 Danbury Rd., Wilton, CT 06897.

AIRCRAFT RESEARCH—Need documentation? Send the name of your favorite aircraft with \$2 for 3-view and photo lists. Mr. I.A. Ross, 1447 Helm Crt., Mississauga, Ont., Canada L5J 3G3.

WE DISCOUNT QUALITY SUNGLASSES! Ray-Bans far below retail! Free catalog! JAP4, 6617 Fairdel Ave., Baltimore, MD 21206.

ROHACELL® STRUCTURAL FOAM. Light, strong, ideal for use with fiberglass, carbon or kevlar. Compatible with most adhesives and finishes. Send SASE to: Composite Structures Technologies, Dept. C, Ste. 268, 3701 Inglewood Ave., Redondo Beach, CA 90278-1110.

FOR SALE: Model Airplane News, Flying Aces, Air Trails, 1934-1960, others. \$1 for list. Bruce Thompson, 328 St. Germain Ave., Toronto, Ont., Canada M5M 1W3.

ANTIQUE MODEL IGNITION ENGINES—PARTS CATALOG. 50 pages, precision cast timers, original cylinder heads, point sets, drive washers, spark plugs, tanks. Many engines listed. Large catalog \$4 plus \$1 Shipping. Foreign: \$8. Chris Rossbach, R.D. 1 Queensboro Manor, Gloversville, NY 12078.

ALL ALUMINUM P-51D Mustang Precision 1/4 replica scale R/C kit. Extraordinary museum detail and a thrill to fly! All aluminum chemically milled and cut-out/drilled/formed—ready for assembly. Three sold to date. Complete kit \$3000. (Less engine & radio) Sample rib section and details \$25 or SASE for info. Warbirds, 122 Naubuc Ave. (NAP Bldg.), Glastonbury, CT 06033 (203) 659-1920.

JIM BOHASH Original 1939 Wakefield full-size plans. S.A.M. approved authenticity. Member US Wakefield teams: 1938-1939 Paris, France, New York World's Fair. \$5 US, \$10 outside US. Jim Bohash, 20721 Millard St., Taylor, MI 48180.

"LEARNING TO FLY R/C With or Without An Instructor," \$2.95 plus 65¢ postage. Jim Waterman, 3818 Deerfield Dr., San Antonio, TX 78218.

CARBON FIBER: sheets, rods, angles, mat, tailboom. Send SASE to: Bradley Model Products, 1337 Pine Sap Ct., Orlando, FL 32825.

OLD TIMERS, take a ride back in time to airplane modeling roots with this vintage book—*Gas Models*. A true collector's book from the early editors of *Model Airplane News*. It contains the best of modeling from the 30s and 40s, including great technical information and classic construction articles from the Golden Age period. \$7.95, add \$1.75 S&H; Foreign Surface Mail, add \$2.75; Foreign Airmail, \$5.50; Payment must be made in U.S. funds drawn on a U.S. bank or by an International Money Order. Air Age Mail-Order Service, 251 Danbury Rd., Wilton, CT 06897.

BAIL OUT! Exciting scale-like parachutist, with quality hand-sewn chute is released from your R.C. plane. Works with any 4 or more channel equip., brochure, SASE, R.C. ACTION CO., P.O. Box 12931, Wichita, KS 67277.

5TH ANNUAL CAROLINA MODEL & HOBBY EXPO: Static Show & Swap Shop, November 26-27; Charlotte, NC, Merchandise Mart, 2500 E. Independence. Info: SASE to Carolina Hobby Expo, 3452 Odell School Rd., Concord, NC 28025 (704) 786-8373.

HARRY HIGLEY Book Clearance Sale. *Tom's Techniques* by Tom Ingram and Harry Higley. All about applying plastic film covering and finishing in all areas, including ailerons, fillets, radial cowls, wing tips, etc. Step-by-step photos. Reg. \$10.95; clearance, \$7.95 plus \$1.75 S&H. Air Age Mail-Order Service, 251 Danbury Rd., Wilton, CT 06897.

R/C WORLD—ORLANDO, FL, CONDO RENTALS—2 and 3 bedroom-furnished. Available weekly or monthly. Low rates. 100 acre flying field with enclosed hangar. Swimming pool, tennis courts on site. Minutes from Disney World and Epcot Center. For information call Allison, (800) 243-6685 or write to Air Age Inc., Condo Dept., 251 Danbury Rd., Wilton, CT 06897.

BEST SELECTION OF IMPORTED DIESEL ENGINES. Current production Aurora, D-C, Enya, MK-17, MVVS, KMD, PAW, Pfeffer, and Silver Swallow. Mills and Taplin Twin replicas. Also rare imported glow engines. Catalog \$1. CARLSON ENGINE IMPORTS, 814 E. Marconi, Phoenix, AZ 85022.

AERO CLUB OF ISRAEL modeling flying needs your support, send SASE for Newsletter and information. NEW Friends of the Aero Club of Israel, 79-02 C 212 St., Bayside, NY 11364.

FOR SALE: Dave Platt Kits 1/5-scale Zero & Focke Wolf, Top Flite & Royal kits, Futaba radio. Other items. SASE for list. C.A. Abernathy, 10206 Windbluff Dr., Richmond, VA 23233.

ENGINES: IGNITION, GLOW. Collectors, runners, used, new. Sell, trade, buy. SASE for list. Rob Eierman, 504 Las Posas, Ridgecrest, CA 93555; (619) 375-5537.

WANTED: 28-48 Model Kits, Engines, Magazines, Racecars. What do you have? Richard Rundell, 2933 Daneland St., Lakewood, CA 90712.

CAPACITIVE DISCHARGE IGNITION KIT—Coils, Spark Plugs. Send SASE for details. Fuji-Max USA, 2747 Giddings, Visalia, CA 93291.

BYRON PERFORMANCE PACKAGE WANTED: Prefer new in box. Would consider mint used. O.S. or Rossi engine; size open. Priced reasonably. John R. Nemetz, 208 Adams, Cumming, IA 50061; (515) 981-0912.

FREE PIN/PATCH WITH MERCHANDISE ORDER! WWI to present; catalog \$1, refundable. Company of Eagles, 875A Island Dr., Suite 322T, Alameda, CA 94501-0425.

ELECTRIC FLIGHT EQUIPMENT: The best and largest electric flight supply in the Northeast. Specializing in ASTRO FLIGHT Equipment. Send \$2.50 for Catalog to CS Flight Systems, 31 Perry St., Middleboro, MA 02346.

Send ad and payment to *Model Airplane News*, 251 Danbury Rd., Wilton, CT 06897. **Non-Commercial classified ads** (commercial ads of any kind not accepted at this special rate). Rate: 15 words or less, \$4.50 payable in advance. No charge for name and address. Additional words, 25¢ each. **Commercial classified ads** (rate applies to anyone selling on a commercial basis—retailers, manufacturers, etc.) Rate: 50¢ per word, payable in advance. Count all initials, numbers, name, address, city and state, zip and phone number. **Closing Date** for either type of ad is the 20th of the third preceding month (for example, January 20th for the April issue). We do not furnish box numbers. If you would like your ad to run in more than one issue, multiply amount of payment by number of months that ad is to run. It is not our policy to send sample copies of tear sheets.

Classified Advertisers Get **RESULTS** in *Model Airplane News*

DURAPLANE

(Continued from page 141)

Hobby Shack, 18480 Bandilier Circle,
Fountain Valley, CA 92728.

Dave Brown Products, 4560 Layhigh Rd.,
Hamilton, OH 45013.

Carl Goldberg Models, 4734 West Chicago
Ave., Chicago, IL 60651.

Pacer Technology, 1600 Dell Ave., Campbell,
CA 95008. ■

VECTOR

(Continued from page 87)

For those who decide to use iron-on coverings, the instruction book shows two diagrams that give you the required dimensions of the material. (This not only saves time, but also saves wasting material.) I definitely recommend that you use one of these iron-on coverings. Be sure to fuelproof the engine compartment and fuel-tank compartment with clear epoxy paint or polyester resin.

When everything is hooked up, check the throws of all flight surfaces to ensure that they match those stated. Deflection gauges are printed on the plans, and these will help you to set up the throws. The most misunderstood and forgotten step is balancing a model aircraft. Make sure you do this correctly! The plans show three locations for the center of gravity (CG), ranging from 3 1/4 inches to 3 3/4 inches back from the leading edge of the wing. As you build up flight time and become more familiar with the airplane, you can move the CG back for a more snappy performance. I chose the 3 1/4-inch CG setting. Check the lateral balance; this is just a routine check, since the Vector's foam wing panels shouldn't vary in weight.

PERFORMANCE: Flying the Vector was uneventful; my nine-year-old son flew it when it was airborne, and he easily handled a number of oval circuits. (He even did a loop!)

The Vector has trouble performing the full FAI pattern, but it wasn't designed to do eight-point rolls. It performs very well as a trainer, and is ideal for learning to enjoy the sport of flying R/C.

**Here are the addresses of the manufacturers mentioned in this article:*

Carl Goldberg Models, Inc., 4734 West Chicago Ave., Chicago, IL 60651.

Circus Hobbies, 3132 South Highland Dr., Las Vegas, NV 89109. ■

Mighty Wire Bender

Finally! A bending tool that covers a larger spectrum of craftsmen and modeler's needs.

New!



The K & S "Mighty Wire Bender"! It bends 1/4" music wire, but will also bend square and rectangular shaped metal. Clamp the base in a vise and you're ready to go. After a few practice bends, expert results can be achieved. Instructions and illustrations accompany each tool.

Items that can be produced with a little practice are clamps, brackets, landing gear, hangers, etc. It is designed for maximum torque to handle most bending problems.

Stock No. 322

Retail Price \$19.95

Send 25 cents for catalog and price list.

K & S Engineering, 6917 W. 59th St., Chicago, IL 60638 312/586-8503

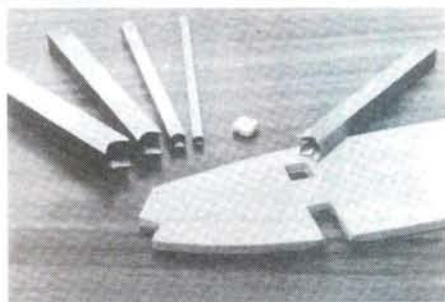


FULL LINE METAL SPECIALISTS

SQUARE CUT TOOLS

Balsa
Cutters

5 pc. Masters Set
1/8, 3/16, 1/4, 5/16, 3/8" ... \$16.98
3 pc. Builders Set
3/16, 1/4, 5/16" \$9.98



Whether you are a kit builder or a scratch builder, SQUARE CUT Tools will save you time. Remove those stubborn die cuts or cut your own squares and slots. Made in the U.S. with quality machined zinc plated steel. Order your set today!

See Your Dealer or Cataloger to Order

(If they don't carry Square Cut Tools, call us — you pay for the call, we'll pay for the shipping.)

SQUARE CUT Tools
(407) 254-0516

905 N. Harbor City Blvd., Melbourne, FL 32935

Dealer/Distributor Inquiries Invited

Florida Residents Add 6% Sales Tax



ZAP UNIVERSITY

COLLEGE OF GLUE KNOWLEDGE



Prof. Sticky VonStuck

Zip Kicker

Accelerator for Zap and other CA's (even the competition's). Stops glue from running. Transforms large beads of Slo-Zap into beautiful fillets. One or 2 light spritzes are all that's necessary. Spray joint after glue has been applied or place glue on one surface. Kick the other, and join. White residue means too much Kicker was used.



Pacer Tech, Campbell CA

TWILIGHTER

(Continued from page 55)

carries the horn should be firm stock. Sand the notch in the rudder with a piece of sandpaper wrapped around a length of wire.

The fuselage consists of two formers and a fire wall, two sides cut from 1/16-inch sheet, some 1/64-inch plywood for the doubler at the fire wall and some leftover sticks from stab construction. The formers are cut from balsa ply, which is made by laminating two pieces of 1/16-inch balsa with the grain running in different directions. The fire wall is 3/16-inch plywood.

Glue the 1/16-inch balsa doublers in the areas shown and epoxy the 1/64-inch ply at the nose. Glue the 1/8-inch-square uprights and the stab reinforcement to the sides. Pin both sides together with doublers on the outside and sand them to the same outline with a sanding block. While they are joined, drill the 3/16-inch holes for the hardwood dowels. Cut the slots in the aft end to clear the pushrod ends, and the sides are ready to become a fuselage.

Glue the formers to one of the sides in the location shown; use a right triangle to make sure they're exactly vertical to the side. Glue the other side to the formers directly over the first, and check align-

ment. When the glue has set, epoxy the fire wall in place, pull the tail together and glue. Sheet the top and bottom of the fuselage with 1/16-inch balsa with the grain running across the fuselage. Sand the completed fuselage.

PERFORMANCE: This is an airplane that can be given a glide test—a rarity in today's world! Remove the prop and aim the airplane at a spot on the ground about 50 feet away, giving it a push about as hard as you'd throw a baseball that you wanted to loft into the spot. If the airplane wants to turn in one direction or the other, correct the tendency by adjusting the clevis on the rudder. If balance is correct and the rudder trim is right, a long straight glide should result. Balance can be achieved by moving the battery pack fore or aft as needed.

Under power and with the radio turned on, launch the airplane in the same way as the glide, but hold a little back stick for a gentle climb. Wait until a little altitude is gained before trying turns. Depending on the power of the engine, the climb can be anything from gradual to frisky. Suit yourself. With the engine using high-nitro fuel and a small prop, loops and snaps are possible, but I enjoy the big prop and low nitro for the relaxing fun of just cruising.

ZAP UNIVERSITY

COLLEGE OF GLUE KNOWLEDGE



Prof. Sticky VonShtuck

Z-7 Debonder

The finest debonding agent available in the hobby industry today. Simply put a few drops on cured CA and repeat a few times. Hardened glue will eventually soften and peel away. Test first on some plastics.

Pacer Tech, Campbell CA

ADVERTISER INDEX

Ace R/C	101
A.H. Designs	124
Airtronics, Inc.	72-73
America's Hobby Center	131
Associated Electrics	7
Balsa USA	51
Basics of R/C Cars Book	123
B&J Enterprises	50
Bob Dively	9
Bob Violett Models	56-57
Bridi Air	81
Byron Originals	40
Carl Goldberg Models	92
Century Jet	110
Circus Hobbies	104-106
Classified Directory	142
Cleveland Model & Supply	130
Conley Precision Engines	85
Coverite	29
Cox Hobbies	125
Cressline Model Products, Ltd.	130
Dave Brown Products	80
Davey Systems	88
Doctor J's West Coast R/C Warehouse	10, 33, 43
Doylejet	139
Dremel	119
Du-Bro Products	91
Duracraft	107
Fox Manufacturing	122
Futaba Industries	C3
Global Hobbies	95, 117
G.M. Plastics	84, 100, 108
G.M. Precision	141
Gorham Model Products	84
Great Planes	71

Historic Aviation	21
Hobbico	31
Hobby Lobby International	78-79
Hobby Shack	109
Hobby Shop Directory	134
Imitari	130
Jet Model Products	127
J'Tec	50
K&B Manufacturing, Inc.	139
K&S Engineering	145
Kavan	82
Kress Jets	139
Loctite	108, 124
M.A.N. Back Issues	132-133
M.A.N. Books	136-137
M.A.N. 400 Great Modeling Tips	115
M.A.N. Helicopter Book	126
M.A.N. Plans	128-129
M.A.N. Posters	144
M.A.N. Subscription	138
Matrix	80
McDaniel R/C	8
M.G.A. Enterprise	94
Micro Mark	120-121
Midwest Products, Inc.	3
Miniature Aircraft	63
Model Products	135
Model Rectifier Corporation	C2, 4, 65
Model Retailer	100
M.V.P.	114
O.S. Engines	C4
Pacer Technology & Research	50, 84, 92, 100, 107, 108, 110, 118, 124, 135, 145, 146
Petco Quadra	130
Powermaster	83

Radio City	93
R.C.B.M. Subscription	143
R.C.C.A. Subscription	11
Retailer Ad	88
Robart Manufacturing	111
Robbe	116
Royal Products	23, 35
See Temps	139
Sheldon's Hobby Shop	96-99, 118
Sig Manufacturing	38-39
Slimline	94
Square Cut Tools	145
Steve Petrosky	118
Sunshine Hobby	139
Tatone	110
Technopower II, Inc.	134
Teleflite Corporation	140
Tidewater Hobby	114
Top Flite Models	37
Tower Hobbies	112-113
Vailly Aviation	139
Vinylwrite Custom Lettering	82
Watkins Aviation	140
Williams Brothers	135
Zenith Aviation	17
ZTec	140